EN 2

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Office of Human Development Services
Administration on Aging

Proceedings of A Symposium On

Energy Costs and the Elderly: The Next Twenty Years

NEWARK PUBLIC LIBRARY
MAR 1 . 1986
U. S. GOVT. PUBS.
DEPOSITORY 376

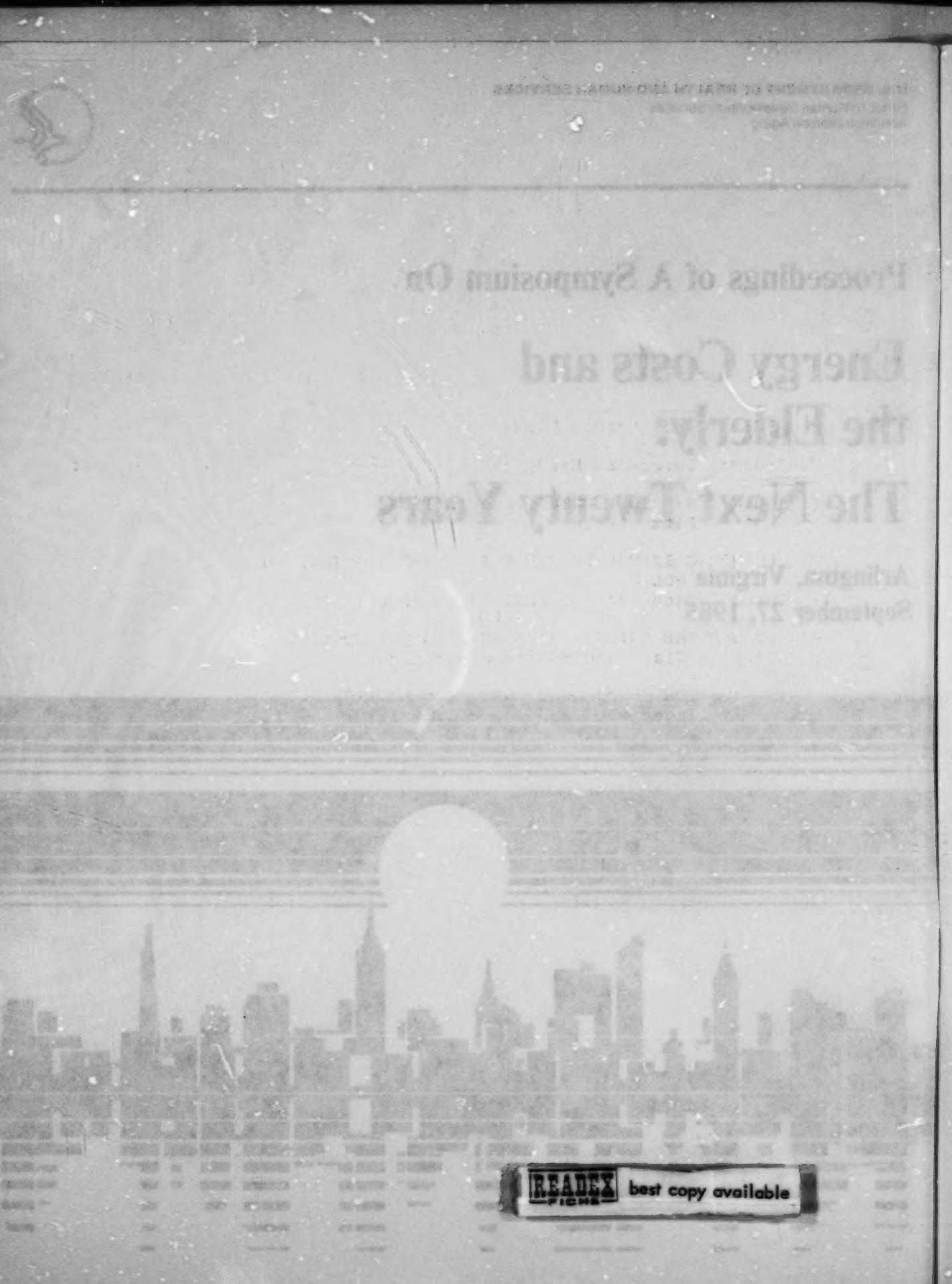
HE 23.3002:

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Office of Human Development Services
Administration on Aging

Proceedings of A Symposium On

Energy Costs and the Elderly: The Next Twenty Years

Arlington, Virginia
September 27, 1985



READEX MICRO best copy available

TABLE OF CONTENTS

	Page
PREFACE: Carol Fraser Fisk	v
FOREWORD: Dorcas R. Hardy	vii
INTRODUCTION: SOME ENERGY PERSPECTIVES Donna R. Fitzpatrick	1
THE ECONOMIC STATUS OF THE AGED: IMPLICATIONS FOR ENERGY POLICY Aldona E. Robbins and Paul Craig Roberts	9
ENERGY AND THE AGING: HOME HEATING AND COOLING Robert L. Clark and Edward W. Erickson	37
TRANSPORTATION NEEDS OF A "GREYING" AMERICA S. Fred Singer and Candace C. Crandall	61

The views and opinions expressed in this publication are entirely those of the authors and are not necessarily those of the Department of Energy or the Department of Health and Human Services.

PREFACE

I am pleased to present these papers on energy supply and the elderly in the year 2000. The demographic reality of the near future is a burgeoning older population, many of whom will be frail. The energy-related concerns of these and all older persons have important health and economic implications and are of ongoing concern to the Administration on Aging. I hope that these papers will evoke new thinking about significant energy issues and assist in the development of solutions which preserve the independence of older persons.

Carol Fraser Fisk
Acting Commissioner
Administration on Aging
Office of Human Development Services

FOREWORD

When President Reagan assumed office in 1981 he initiated a set of social and economic policies designed to restore health and vigor to American society. He proposed legislation and programs designed to cut the costs of government, eliminate unnecessary governmental regulations, lower inflation, and by these means increase employment, wages and income. For the nation as a whole, his approach stressed the value of a strong free-market system of decision making rather than growing dependence on government programs.

It was in this spirit that it was decided it would be timely to look more closely at the issues of energy supply and demand, particularly as these related to the older consumer. What had been the affect of deregulation and lower inflation on the availability of price of energy sources? What changes have occurred in price, supply, fuel mix and conservation that are significant to consumers, especially older consumers? How do elderly households compare with younger households in the precentage of income needed for energy costs? Is it true that the elderly are really more dependent on energy than other parts of the population? Do the elderly tend to live in older, energy inefficient dwellings? As you grow older do you require more or less transportation? Does the cost of energy represent a financial burden for elderly households? What is the economic status of the elderly population at the present time? The next twenty years?

In cooperation with the Office of Conservation and Renewables, U.S. Department of Energy, the Office of Human Development Services on September 27, 1985 conducted a symposium on our nation's energy supply and its availability to the elderly into the 21st century entitled "Energy Costs and the Elderly: The Next Twenty Years."

The major portion of the symposium was devoted to the presentation of three papers by distinguished economists and social scientists. They are presented here following an "Introduction" by Donna R. Fitzpatrick, Assistant Secretary for Conservation and Renewables in the Department of Energy, who describes the present state of energy availability. The

first of the presentations, "The Economic Status of the Aged: Implications for Energy Policy" was prepared by Aldona E. Robbins and Paul Craig Roberts of The Institute for political Economy. Their charge was to look at the financial condition of the elderly portion of American society and determine whether or not their economic status warrented additional protection by the government.

The second paper examines a number of questions designed to learn the extent to which the costs of heating and cooling are associated with age, income and other variables. The paper is the product of studies conducted by Professors Robert L. Clark and Edward W. Erickson at North Carolina State University. The third paper, prepared by S. Fred Singer and Candace C. Crandall of George Mason University is titled "Transportation Needs of a Greying America." The paper examines the transportaton needs of an aging population according to several different scenarios based on different fuel requirements that are possible between now and the year 2010.

The success of an undertaking such as the symposium on "Energy Costs and the Elderly: The Next Twenty Years" is dependent on the help and cooperation of many persons. In particular, this symposium would not have been possible without the support and cooperation of the President's Office of Consumer Affairs, the Office of Conservation and Renewables, U.S. Department of Energy, and the Adminstration on Aging, U.S. Department of Health and Human Services. A special note of thanks goes to the American Gas Association for hosting the symposium and to Robert Smith, The Futures Group, Inc., for serving as the meeting facilitator.

Dorcas R. Hardy, Assistant Secretary
Office of Human Development Services
U.S. Department of Health and Human Services
Washington, D.C.

SOME ENERGY PERSPECTIVES

by

Donna R. Fitzpatrick
Assistant Secretary for
Conservation and Renewable Energy
U.S. Department of Energy

In order to adequately address the energy needs of the elderly, it is imperative that we have a clear perspective on the energy context in which we place our discussion. In order to provide an energy perspective that will assist us in ministering to the elderly at their point of need in the most effective and efficient manner, this paper will provide a brief overview of the energy picture today, discuss current actions being taken by the Department of Energy and others to address our energy needs, and describe how this may affect our energy future.

The first question to ask in considering our energy context is "Where do we as a nation stand now in the energy picture?" Our situation has improved since 1973, but there is still much that can be done. In 1983, our oil consumption was at its lowest since 1970, although it increased slightly in 1984. Since 1973, the energy needed to produce a constant dollar of gross national product has fallen by 24 percent. In fact we actually consumed less energy in 1984 than in 1973, 74.1 quadrillion Btus versus 74.3 quads, despite 31 percent growth in Gross National Product. Our energy supplies are shifting, with growth in coal, nuclear, and renewables, while oil imports in 1983 were only half of the peak level reached in 1977 and were down further through the first three quarters of 1985. We have diversified our sources for imported oil and now buy only about nine percent of net imports, less than three percent of total consumption, from the Persian Gulf producers. Our major suppliers are Great Britain, Canada, Venezuela, Indonesia, Mexico, and Nigeria.

Can we now forget the energy crisis? Definitely not. We may have won some breathing room, but this is no time to be complacent. Our net imports of petroleum are still over four million barrels per day and domestic production is projected to fall off in the future. The contribution that nuclear energy can realistically be expected to make is not going to continue growing significantly in the mid-term, given that the lead time for a new plant is in excess of ten years and none are now on order. There are unresolved environmental issues affecting the use of coal and many renewable technologies are still unproven on a commercial scale or not yet economically competitive outside of special market niches, such as remote electric supply applications for photovoltaics.

The Reagan Administration has set a national goal of fostering an adequate supply of energy at reasonable costs, while protecting the environment and public health and safety. The strategies for achieving this goal are to promote a mixed and balanced system of energy resources and minimize federal control and intervention in the market place. The Department of Energy is working toward the national goal. Oil prices were decontrolled in 1981 and some natural gas price controls have expired. The result is that today's elderly are benefitting from energy prices that have declined dramatically and may fall some more. Many people are even saying that we are in an energy glut.

The truth is that we have always been in an energy glut, at least with respect to energy potentially available to us. We just had and still have a bad petroleum habit. We need to be smarter about how we use energy and stop losing to inefficiency most of the 74 quads of primary resources we consume each year--because there is one thing we can be sure about: even though we do not know when oil and natural gas will run out, we do know that the supply is finite.

Therefore, we need to develop our supply resources in an environmentally safe and economically sound way, making choices and public policy based on accurate and unbiased information. We need nuclear power without unnecessarily inflating its costs; we need clear coal technologies; we need greater efficiency and renewable supplies that are reliable and cost competitive.

An example of the need for this sort of unbiased information is the current nuclear power situation. We, as a nation, have essentially "shot ourselves in the foot" with regard to nuclear energy. The problem with nuclear energy is not, as is often thought, a technical problem or a safety problem; it is a public relations problem. As an example, take the safety issue. It is a little known fact that one is actually exposed to less radiation living next door to a nuclear power plant at sea level than one would experience standing in a parking lot in Denver, Colorado (at an elevation of one mile). This is simply due to cosmic and solar radiation--however, we seldom hear about this relative safety of nuclear power. On the technical side--the technology currently exists to produce small reactors based upon standardized designs that can produce power at costs that compare very favorably with other sources of power. For example, France is using designs developed by Westinghouse to build nuclear power plants in less than half the time that it takes to build one in the U.S. and for only about one-third the cost. Almost 60 percent of the electricity now generated in France is produced by nuclear plants. In other words, nuclear power is an American technology that is being more successfully utilized by other nations. Since the last U.S. reactor order, which took place in 1978, there have been over 100 foreign reactor orders.

In contrast to that problem, the opportunities for improving our energy health are impressive. We can still make substantial increases in efficiency. We are using 14 quads less per year now than we would have if 1973 practices had continued. That amounts to about the equivalent of the amount of energy that would be supplied by four Alaska pipelines. If we adopt presently available technologies and are reasonably successful in research and development we can expect to reduce consumption by another 16 quads/year by the year 2000.

At the same time, the contribution from renewable resources is growing and is now nine percent of U.S. energy production. Assuming reasonable success in public and private R&D, renewable energy options could be economically competitive for 75 percent of our needs within 25 years. This is not to say that renewables will be supplying 75 percent of demand, but that the options could be available and people will have a choice. Choice: that is after all, what we need--the freedom to choose so that we will never again find our national security threatened by interruption of a particular resource supply, or our economic growth stymied by inflexibility, unacceptable costs, or short supplies, or world peace shattered in a battle for oil.

As a nation, we can do better than to lose through inefficiency more than half of our gross energy production. We must have the patience and the foresight to maintain our course and work for the long-term benefits, knowing that the time required for new energy technology to move from invention to significant market penetration has historically been measured in decades. For example, the amount of time required from invention to significant market penetration has been for

Heat pumps: 50 years;

Diesel engines: 100 years;

Low head hydropower: 70 years.

Improved information transfer and more efficient markets should shorten those decades, but it is still up to those who understand both our needs and the opportunities to work and plan for the future, even in a time when change can seem frustratingly slow. I am encouraged, too, as I consider this perspective because I can see the value of our research programs over the longer time in addressing these needs by helping to make energy more affordable for all.

The Department supports a wide range of research in fossil fuel utilization, fusion, nuclear reactor design and waste disposal, conservation (end-use efficiency), and renewable supply technologies. The goal is to match our energy needs with secure supply options to assure energy nondependence and freedom from the kind of economic and strategic pressures to which we have been vulnerable in the past.

No one can say now exactly how nondependence will be achieved. Certainly it will be in part through the use of technologies already available or being researched today; quite possibly it will include ideas and inventions still undreamed of. But it is easy to imagine some aspects of what it could be like to live in a society that has learned to use energy efficiently and produce it economically from abundant or non-depletable resources. Let me take you, for a moment, on a journey into our energy future. A typical homeowner might enjoy a morning shower of hot water supplied by his reliable, inexpensive solar water heater. He could brew his coffee and fry his eggs with electricity from his own or his utility's photovoltaic array. The energy generated in the daytime could be stored in highly efficient batteries for nighttime and early morning use. Ready for work, he travels

in an electric vehicle, clean and quiet, to an office building which is heated by sunlight and the heat from its own lights, occupants, and machinery. The building has "smart" windows, which can adjust the transmission of heat and light according to time of day and season of the year. These are not pipedreams; they are only a handful of the technology advances that are being explored in federal and private industry research projects. Some techniques and products resulting from this type of research are already commercially available; they will surely be improved and others will follow.

The role that the Department of Energy plays in the process is to emphasize basic and applied research in areas where the private sector will not work alone because the risks are too great or the time to payoff is too long. Research is conducted by the Department's Office of Conservation and Renewable Energy (CRE) to increase energy efficiency and productivity in the end-use sectors of transportation, buildings, and industry. CRE's research in renewable energy technologies addresses the basic problems that must be solved to lower their costs and increase their efficiency and reliability. CRE works closely with American industry to identify research needs and plan and execute projects. If possible, federal projects are carried out on a cost-shared basis with industry. Besides leveraging the taxpayers' investment, this has the twofold effect of assuring that industry has an interest in the research results and that it will know about them. Federal research in areas where the government is not the ultimate consumer is largely useless unless the results can be transferred to someone with the interest and ability to decide whether a technology is economically viable and develop a commercial product. Therefore, technology transfer is an integral part of project management. Projects are planned from initial research through to final delivery of a product to the marketplace. The federal government will not be responsible for every step along the way, but it must be clear that there is a need for the results and a path with interested parties to pick up where the government leaves off, if the research is successful.

Research is driven by real needs and opportunities. For example, there is a great need to increase the efficiency of our road transportation, which uses two-thirds of the oil consumed in this country. The gasoline and diesel engines used in automobiles and trucks cannot be made much more efficient (most of the doubling of the average automobile mileage ratings in the last ten years resulted from smaller and lighter vehicles). We need to make a fundamental change in the engine and the most promising route is higher operating temperatures, in the range of 2300°F. Because no known metal or alloy can withstand such temperatures without melting, the engine will have to be made of ceramic materials. Until recently there were no ceramic materials available which could be fashioned to the tolerances required and withstand the mechanical stresses involved. Basic new information was needed about how ceramic material can be formed, what combinations of such elements as silicon, hafnium, and boron will work, what causes cracking and how it can be stopped. Federally funded research, cost-shared with industry teams from Ford, General Motors, Garrett, and Allison, has made significant advances and the researchers will soon be testing ceramic gas turbine engines at close to optimum operating temperatures. There are still many problems to be solved, ranging from lubrication to economical production processes, but this project typifies the research strategy of identifying a need and a possible solution and teaming with industry to solve the basic technological problems. The economic evaluation of research results and the development of a production process and a product are the responsibility of the private sector.

Another area in which the Department of Energy has been very active in recent months is what we call our "Partnership Program." We are working with state and local governments to help them to build partnerships with the private sector in order to expand the impact of our energy conservation grant programs. We are convinced that the job of helping those who are in need to deal with their energy use is one that will require a greatly increased effort and we are already seeing a great deal of interest in the private sector in being involved in meeting these needs. Many utilities around the country are actively addressing the needs of their customers, especially those with low or fixed incomes, to assist them in improving their energy efficiency so that their needs can be met at lower cost. These utilities understand that their efforts not only are good for public relations, but are also necessary to reduce the need for new generating or supply capacity, which is an expensive and risky proposition.

Many of the steps needed to achieve our national goal of an adequate energy supply at reasonable costs will have to be taken by public utilities, businesses large and small, entrepreneurs, and investors, as well as governments at all levels. But we are all consumers of energy in our homes and workplaces, our means of transportation, even our entertainment. We can all control, to a greater or lesser extent, how much energy we consume. As more energy supply options become available in the marketplace, individuals will even be able to choose some of their energy supply sources and shift from reliance on petroleum to more abundant or renewable resources. This is already possible in the solar energy products for home use and passive solar home designs. Alcohol as a transportation fuel is beginning to penetrate the market, while natural gas is being used in automobile, light truck, and school bus fleets and may soon be available for individual consumers. Wood has become a major source of residential heating in New England and some areas of the West. This ability to tailor the energy supply source and match it with the needs of the end-user will be of great value to the elderly in the future.

We each owe it to ourselves, to the elderly, and to our country's future well-being to be informed about the choices such as these which are available to us in our use of energy. The benefits can be realized immediately in reduced utility and gasoline expenses and the long term dividends will be enjoyed by all of us and our children in the decades to come. We do not yet know when in the future we will need certain new forms of energy supply. We do know that we will some day have to make a basic shift in our reliance on oil and natural gas and we at the Department of Energy are working together with the private sector to assure that our research programs will have "on the shelf" the technology base that will then be needed so as to avoid the kind of disruption and waste that we saw in the 1970s. If we, working together, can succeed in these efforts, particularly in increasing the efficiency and reliability of new technologies and decreasing their costs, America (including our elderly) can be assured of stable and secure energy supplies for generations to come.

Note: The U.S. Department of Energy, Office of Conservation and Renewable Energy, provides two services from which citizens can obtain information on how to use energy efficiently and produce it from alternative sources. The National Appropriate Technology Assistance Service (NATAS) provides information on energy supply technologies (e.g., wind, small hydropower, solar, and biofuels) which are suitable for homes, farms, and small businesses. The Conservation and Renewable Energy Information and Referral Service (CAREIRS) provides advice on energy efficiency improvements and supply alternatives for homes and businesses. The addresses and toll-free telephone numbers for NATAS and CAREIRS are:

NATAS
U.S. Department of Energy
Box 2525
Butte, MT 59702-2525

Phone: (800) 428-2525; (800) 428-1718 in Montana

CAREIRS
P.O. Box 8900
Silver Springs, MD 20907

Phone: (800) 523-2929; (800) 462-4983 in Pennsylvania
(800) 233-3071 in Alaska and Hawaii

THE ECONOMIC STATUS OF THE AGED: IMPLICATIONS FOR ENERGY POLICY

by Aldona E. Robbins*
Paul Craig Roberts*

Introduction and Overview

The average age of the U.S. population is increasing. The baby boom of the post World War II era followed by a baby bust[1] of the last two decades means that the percentage of persons age 65 and older will gradually increase. Today the elderly comprise 12 percent of the population.[2] By the year 2010, when baby boomers begin to retire, the aged's share will reach 14 percent and grow to 22 percent by 2035.[3] The growth of the aged as a percent of total population is shown in the top chart of Plate 1. (p. 32)

There is growing concern about the economic and social ramifications of an "aging America." The concerns often center around two commonly held beliefs. The first is that the elderly are, on average, poorer than the rest of the population and cannot afford necessities such as health care and energy. The second concern stems from the belief that the needs of the elderly are different from the rest of the population and that these needs cannot be adequately met without government intervention. The implication of this conclusion is that even greater resources than those now being provided will have to be transferred from the working age population to the aged population.

---

*The Institute for Political Economy

[1]The fertility rate dropped from 3.61 births per woman of child-bearing age in 1960 to 1.74 in 1976. The fertility rate in 1983 was 1.76. The zero population growth fertility rate is 2.1.

[2]The term elderly (or aged) is used to refer to persons age 65 and over.

[3]1985 Annual Report of the Board of Trustees of the Federal Old-Age and Survivors and Disability Insurance Trust Funds, Table A1, p. 77.

Neither of these commonly held beliefs are well supported by actual data. Both make the common error of treating the elderly as one homogeneous group with regard to income, health status, and personal preferences. The second also reflects a basic misunderstanding about the ability of unfettered markets to achieve acceptable solutions without the interference of government officials.

The analysis in this paper indicates that, of all segments of the population, the aged are the best equipped to make the requisite adjustments demanded by the market economy. The aged have more income and constitute the wealthiest age group in U.S. society. Furthermore, their consumption patterns do not differ markedly from those of the general population. Consequently, an aging population will not have an overall energy demand that will run counter to what the economy will supply.

Whatever the energy demands of the elderly, inhibiting market forces will not benefit consumers -- aged or not. As the paper discusses, government intervention through regulation, taxation, or increased spending decreases the economy's productive efficiency. This raises costs for everyone. Rather than increase direct intervention, the appropriate role for the government is to reduce its regulation of energy markets and undertake policies which encourage economic growth. A healthy economic environment will, in and of itself, foster the undertaking of necessary research, the development of new technology, and the production of what consumers want.

The real concern about an aging population is whether a society which has undertaken a high level of income transfers based solely on age can maintain its economic vitality. Beginning with the old-age pension of social security in the 1930's, there has been a growth in entitlement programs based upon age. These entitlement programs have grown in the scope of persons covered, in the types of benefits provided, and in the level of real, inflation-adjusted benefits paid.

Social security has unquestionably increased the wealth of the elderly. What must be recognized is that this increased wealth has come about by transferring wealth from younger workers. This redistribution has not been without cost, and it has decreased the overall growth in economic wealth since it imposes a heavy burden of taxation on

productive activity. High tax rates raise the cost of using productive resources and result in lower rates of income growth. Lower rates of income growth mean a smaller tax base to support government spending programs and, therefore, even higher tax rates. As the average age of the population increases, social security is expected to grow accordingly, and the burden of this wealth transfer on society will continue to increase.

To evaluate whether an energy policy for the elderly as a group is warranted, it is appropriate to first examine the economic status of the elderly. The paper then presents evidence concerning energy expenditures by the elderly and by the consumers in general. This is followed by a discussion about the operation of markets and how they are distorted by government intervention. Finally, recommendations are made that would promote the efficient production and consumption of energy.

The Current Economic Status of the Elderly

Popular opinion stereotypes the elderly as poor, in frail physical condition, and dependent on society for care. Not only is this image debasing to the aged, it is incorrect.

Americans age 65 and older are perhaps the most well-off age group in the economy today. The top chart in Plate 2 shows the mean 1982 after-tax income per capita for household by age of the householder.[4] The per capita after-tax income of families headed by someone age 65 or older is among the highest of all age groups.

Households headed by current retirees have almost one-third more income to spend per family member than households of baby-boomers. The after-tax income per member is $8,599 where the age of the householder is 55 to 59; $8,505 where the age of the householder is 60 to 64; and $7,845 where the age is 65 and over. This contrasts with an after-tax per capita income of $6,158 for householders age 30 to 34 and $6,065 for householders age 35 to 39.

The wealth position of older households is also substantially higher than that of younger households. The bottom chart in Plate 2 shows median household financial assets in 1983 by age of householder.[5] Older households have about three times the financial assets as do households in the age group 35-44.

This information should help dispel the notion that the aged, as a group, are economically disadvantaged relative to the rest of the population. In fact, the reverse is the case. Elderly households, on average, have one-third more after-tax income per member than baby boom households and three times the financial wealth.

---

[4]Data are taken from After-tax Money Income Estimates of Households: 1982, U.S. Department of Commerce, Bureau of the Census, Current Population Reports, Series P-23, No. 137, Table 1.

[5]Data are taken from the Economic Report of the President, February 1985, Table 5-5. Financial assets include liquid assets, such as checking accounts and savings accounts, plus stocks, other bonds, nontaxable holdings (municipal bonds and shares in certain mutual funds), and trusts.

This does not mean that there are no elderly poor. There are, as there are in all age groups. The poverty rate among unrelated individuals age 65 and over is 26 percent and is 18 percent for non-elderly unrelated individuals.[6] The poverty rate for elderly families, however, is 9 percent as compared to 12 percent for non-elderly families.[7]

Aged women, especially those past 70, who live alone account for almost half of the elderly poor. These women are generally widows who rely primarily on their husband's social security benefit. The greater availability of private pensions for survivors and spousal Individual Retirement Accounts as well as more education and greater work experience should improve the economic status of these women in the future.

Income distribution statistics make clear that programs for the elderly as a group are not programs for the poor. Poverty statistics could more easily be used to argue that children, who comprise 40 percent of the poor and together with their families constitute over two-thirds of the poverty population, require a special energy assistance program.[8] Taxing younger households in order to transfer income to the elderly as a group results in the redistribution of income from the less well-off to the more well-off.

---

[6] 1985 Economic Report, Table 5-4, p. 166.

[7] Almost 69 percent of the non-institutionalized elderly live in families

[8] Reducing Poverty Among Children, Congressional Budget Office, May 1985.

The Future Economic Status of the Elderly

The economic position of each subsequent group of retirees should continually improve. The real lifetime wages earned by younger groups are higher than those earned by older groups because of economic growth. Because social security and private pension benefits are related to lifetime earnings, the retirement income from these sources will be higher for each successive cohort.

More and more workers are now covered by private pensions. The increasing labor force participation of women means that a much higher percentage of future retirees will have social security and private pensions in their own right. The economic position of widows, generally regarded as the worse-off among current retirees, will, therefore, also improve.

Benefits currently promised by social security are the major reason for the increasing wealth of the elderly over time. Social security initially covered workers in commerce and industry, about 73 percent of total employment. Today, over 96 percent of economy-wide employment is covered by social security. Initially, the retirement benefit was equal to approximately 30 to 35 percent of the final salary for an average wage worker. Today, social security provides a retirement benefit equal to 42 percent of the final, before-tax salary for an average worker.[9] The replacement of after-tax wages is about 55 percent. In other words, not only are more and more persons receiving social security, but each recipient gets a benefit one-third higher after adjusting for inflation than through most of the history of the program.

---

[9]This significant increase in the replacement rate occurred as a result of the 1972 Social Security Amendments which introduced automatic indexation into the benefit formula. A common misconception is that social security's recent financing problems are due to the cost-of-living adjustment. In fact, they are due to the double indexation of the initial benefit formula which raised replacement rates to 55 percent for an average worker by 1981. The 1977 Amendments corrected this over-indexation but lowered the replacement rate to 42 percent for the average worker rather than to its historical range of 30 to 35 percent.

Assuming real wage growth at 1.5 percent per year, social security benefits will double in real terms between now and 2025 and triple in real terms between now and 2055.[10] Under present law the benefit to a married male high school graduate and spouse will rise from $10,500 in 1983 dollars to $19,500 in 1983 dollars by 2025 and to $29,000 in 1983 dollars by 2055. The benefit for a married male college graduate and spouse will rise from $11,000 in 1985 to $22,300 in 2025 to $33,000 in 2055 (all expressed in 1983 dollars).

This large increase in real income for future social security recipients poses serious problems for the society. Indeed, it is possible that the U.S. has done so much to address the problem of the aged that the burden of the transfer is becoming the real problem. This may not be recognized because of misconceptions about social security.

There is a common misconception that social security benefits are somehow financed through "savings." Some still believe that the payroll taxes paid by a worker are actually "contributions" that go into an interest-bearing account belonging to the worker which later pays the worker's social security benefits. This has never been the case. In fact, social security payroll taxes have always been paid out almost immediately in the form of benefits to persons already retired. The trust funds act primarily as depositories for payroll taxes.[11] The myth about individual worker retirement accounts should have been put to rest when the Old-Age and Survivors Insurance (OASI) trust fund ran out of money in the fall of 1982.

---

[10] Real wage growth of 1.5 percent per year is on the low side of actual experience since World War II.

[11] Payroll tax collections credited to the social security trust funds are traded for U.S. government securities specially designated for this purpose. These special issues can be redeemed at par. Interest on the issues is determined by a formula specified in the Social Security Act.

Another misconception relates to the projected massive build up of OASI and Disability Insurance (DI) trust fund reserves over the next 40 years. The notion that the cash benefit program is in "sound financial condition" depends upon the assumption that payroll taxes collected from the baby boom generation will be substantially more than is needed to pay for outgo. These excess taxes will be allowed to accumulate as trust fund reserves which in turn earn interest. Under this scenario, the OASI and DI trust funds would build up to $2 trillion in today's dollars by 2030.[12] Because the program would begin running annual deficits between 2015 and 2020, interest on the trust fund reserves would play a major role in financing benefits.[13]

There are three problems with this view. The first is that the financing problems of in-kind medical benefits have been ignored. Medical benefits were added to social security in 1965. Medicare pays for hospital care through the Hospital Insurance program and for physician services through the Supplementary Medical Insurance program. The HI trust fund is projected to deplete in the 1990's and run continuing and widening deficits thereafter. Just as the reserves of the Hospital Insurance trust funds were loaned to OASI in 1982, the reserves of OASI and DI are likely to be used to cover HI deficits.

If reserves do actually accumulate, the reserves themselves are likely to lead to further misconceptions. Some people are bound to conclude that reserves mean that the social security system is no longer a wealth transfer mechanism, and the accumulated reserves would be misinterpreted as a net addition of capital to the economy. This would be a fundamental mistake. The reserves do not add to net saving. What happens is that during periods of accumulation, existing assets are transferred from private hands to the social security trust funds in "exchange" for future promises of social security benefits. These promised benefits are ultimately paid by reselling the debt to the private sector and, as necessary, by additional transfers from later generations. There is no net savings. Furthermore,

---

[12]See Long-range Estimates of Social Security Trust Fund Operations in Dollars, Harry C. Ballantyne, U.S. Department of Health and Human Services, Social Security Administration, Actuarial Note 125, April 1985, Table 1, Alternative II-B.

[13]Interest on trust fund reserves is projected to exceed the annual operating deficits between 2015 and 2030.

since there is no direct link between the earnings of the "contributions" and the value of promised future benefits, it is likely that total savings (and investment) fall because of the social security program.

Social security transfers to the elderly a portion of the real output produced by the private sector of the economy. The bottom chart in Plate 1 illustrates the current and future transfer of real resources in terms of gross national product (GNP) and wages and salaries (W&S) that will be required to pay cash and medical benefits currently promised by social security. In 1985, social security will transfer 6.2 percent of GNP from the private sector to the aged population. Social security benefits are expected to require 7.9 percent of GNP by the year 2010 and 12.4 percent by 2035.[14]

The transfer of resources occurs mainly through a payroll tax.[15] Currently promised social security benefits, which now amount to 13.5 percent of all wages and salaries, will grow to 16.9 percent of total wages in 2010 and 26.9 percent by the year 2035. Payment of currently promised benefits implies a near doubling of the current social security tax rate or a comparable increase in income tax rates to redeem the debt. These payroll taxes are in addition to an income tax rate which is now 26 percent for the average family!

---

[14]These estimates have been made on the basis of projections for Old-Age and Survivors Insurance (OASI), Disability Insurance (DI) and Hospital Insurance (HI) outgo from the 1985 Trustees' Report, Alternative II-B. Supplementary Medical Insurance (SMI) outgo is projected using historical relationships between SMI and HI. GNP is projected assuming taxable payroll comprises 43.7 percent as it currently does.

[15]OASI, DI and HI are financed by a payroll tax on covered workers. All workers with the exception of Federal employees before January 1984 and some state and local employees are covered. The tax rate applies to a wage ceiling which increases each year with the growth in wages. In 1984, 89 percent of total wages and salaries comprised social security taxable payroll. This should rise to 95 percent by 2015 and beyond.

Approximately 70 percent of the Supplementary Medical Insurance program is financed from general revenues and the remaining 30 percent from premiums paid by participants. SMI currently accounts for about 8 percent of social security outgo.

The implications of a payroll tax that will double over the next several decades are serious and wide-ranging. Increases in payroll tax rates lower workers' take-home pay and could raise the cost to firms of using labor. Labor costs increase to the extent that added payroll costs are not absorbed by lower wages. These increases in the cost of labor result in less employment.

Rising payroll tax rates lower employment levels even if the increased payroll taxes do not directly raise the cost of labor to firms. This occurs through lower after-tax wages and labor supply responses. Currently, the combined employer-employee social security payroll tax is 14.1 percent and is scheduled to rise to 15.3 percent by 1990. This 8.5 percent increase in the tax rate will result in 680,000 lost jobs.[16] The lower employment translates into a loss of GNP of $15 to $20 billion per year in 1985 dollars. This tax increase is small compared to those implied by currently promised social security benefits. If the tax rate doubles, the results would be devastating.

Lower growth of employment implies less capital accumulation by firms. Less growth in capital and labor means less growth in output. Total after-tax labor compensation will increase still less. Not only will employment growth be less, but after-tax wage rates will also be lower.

Lower returns for capital and labor mean lower national wealth. A doubling of the payroll tax rate could cause a 23 percent reduction in the real after-tax wage of workers and a 33 percent reduction in their total after-tax compensation. Employment would decline by over 9 percent, as would capital input and output.[17] The result would be a slowdown in economic growth at the very time that the burden of the guarantees to the elderly is increasing.

---

[16]The general concensus of econometric studies is that a 10 percent reduction in take-home pay reduces labor supply by about 4 percent. Social security payroll taxes currently account for about one-third of the overall tax rate. Thus, a 10 percent increase in social security taxes results in a 0.8 percent drop in employment.

[17]These estimates have been derived using standard relationships betweeen U.S. labor and capital. They assume U.S. capital supply is highly elastic which implies that most of the impact of an increase in payroll taxes will be reflected in a lower after-tax real wage.

The implications of rising labor costs, a smaller capital stock, and lower economic growth extend beyond the boundaries of the United States. The international competitive position of U.S. industry could deteriorate, increasing demands for the protection of domestic labor and producers. Protectionism would simply exacerbate the situation. The result of protectionist intervention would be an even lower level of output available to U.S. consumers both now and in the future.

Clearly, policy makers and the general citizenry should be looking at the implications of an aging population on the social security system and on the overall economy. The problems created by this transfer program are so serious that the economy may not be able to take on additional guarantees to the elderly. Furthermore, these guarantees are not needed. Meeting demands for energy, health care, housing, and so forth generated by a population whose average age is gradually increasing can best be handled by a healthy, growing economy in which markets are free to operate.

Energy Usage and the Elderly

A popular notion is that the elderly have a unique set of energy needs. Under this view, the elderly are forced to live in older, less fuel-efficient housing;[18] they are more dependent on labor-saving household appliances; they have special transportation needs because they are more immobile. These notions are often based on anecdotal information which is then generalized to the elderly as a whole.

The Bureau of Labor Statistics has conducted two major surveys of consumer expenditures in the last fifteen years. These surveys collect highly detailed information on expenditures by type of item and data on the characteristics of households, such as income level, region, and size. Table 1 (p. 24) shows the distribution of total expenditures by category for all households and for households headed by a person age 65 or older in 1972-73 and in 1980-81. The results indicate that the expenditures by the elderly on energy-related items do not differ much from those spent by all households. The line at the bottom of the table labelled, "Total Fuel-Related", indicates that 8.39 percent of the expenditures for all households was spent on fuels for home heating/cooling and gasoline in 1972-73; elderly households spent 9.19 percent of their total consumption on these items. The amount spent on fuels in 1980-81 had increased by a little more than 38 percent for both types of households -- to 11.61 percent for households overall and to 12.71 percent for the elderly households.

Elderly households spend relatively more on heating/cooling fuels and relatively less on transportation fuel than do households overall. Expenditure patterns on appliances are about the same for the two groups. Any differences between the two groups in specific energy-related expenditures, however, should not be given undue importance. First, barring government intervention, changes in the cost of energy supplies are likely to affect different categories of

---

[18]According to a 1979 U.S. Department of Housing and Urban Development study, the housing of the elderly closely matches that of the population overall. About 1.6 percent of the housing of the elderly and housing overall had one or more flaws related to heating and 0.1 percent had electrical deficiencies.

energy consumption in very similar ways. This is because there is high substitutability between different energy sources. This substitutability guarantees that prices of different energy sources can never deviate much from one another. Second, any differences in Table 1 that appear to exist on the basis of age are likely to be explained by differences in income level, region, family size, and housing status.[19] Age, therefore, should not be used as the sole factor in explaining energy usage.

Future energy-related expenditures will depend upon available products and services and their prices. Because it is impossible to predict technological change or costs of production, future expenditure patterns of the aged can not be predicted. The evidence presented in this section, however, suggests they will be in keeping with other consumers.

---

[19]An empirical examination of the detailed BLS survey data is beyond the scope of this paper.

How Markets Work

All humans share a common problem: how to best allocate their resources. Decisions involve allotting time between work and leisure; income between consumption and investment; and consumption expenditures among various goods and services. Allowing markets to work freely is the best way to assure that (1) available resources are used in a way that yields the highest output possible, and (2) the allocation of this output is efficient.

A market is simply buyers, who are interested in a product (such as gasoline) or a service (such as labor), purchasing that product or service from a seller. The exchange occurs through a price which sets how much income (or the ability to purchase other products and services) the buyer must give up to get a given amount of the product or service from the seller.

The price set by the market and the amount of the product or service sold depends on the demand and supply of the product. Demand factors depend to a large extent on the preferences or tastes of buyers. A buyer who desperately wants to purchase a good (for example, a diabetic) is not willing to alter his or her demand much over a wide range of prices. A more indifferent consumer will buy the product only within a very limited price range.

Supply factors depend primarily on technology and the costs of inputs such as labor and capital. Products which are inexpensive to produce can be supplied at low prices; conversely, products which are expensive to produce can only be supplied at high prices. For example, when the price of OPEC oil was raised in 1973-74 from $4 per barrel to $37 per barrel by 1981, the costs of goods that used oil in the manufacturing process also rose. The end result was that prices of these products, such as gasoline, increased.[20]

---

[20]In general, if one or more inputs are in fixed supply, the costs of production and, therefore, prices will rise as the quantity supplied is increased.

When the demand for a product increases, its price and the quantity produced and sold will change. For example, if consumers form new opinions that personal computers are really desirable for functioning in a modern world, buyers would be willing to pay a higher price for any given amount of personal computers than previously. With no change in supply conditions, the number of computers purchased would increase and, in the short run, the price of a computer would increase. Over the longer run, the increase in demand for personal computers would encourage new firms to produce computers and increase the quantity supplied. Prices should then return to near their previous levels. In addition, the higher intervening prices also stimulate the quest for the development of new technology.

Similarly, when the supply of a product decreases, we get appropriate price and quantity responses. If the price of an input such as oil increases, the costs of production are higher for every unit of final product produced. The price of the product will be higher, and the amount of the product sold will decrease.

In raising the price of oil, OPEC gambled that U.S. consumers could not vary their demand for petroleum a great deal. They relied on studies which confused short-run adjustments with those in the long-run. Quantitative estimates of the market response to petroleum price changes suggested virtually no quantity responses. Those estimates were proven wrong. Instead, rather than paying higher prices for the same amount of oil, the United States reduced the amount it purchased.

All the expected short- and long-run adjustments occurred. Consumers and producers responded to higher prices of fuel oil and gasoline by switching to more fuel efficient means of heating/cooling and transportation. The high price of oil encouraged the use of substitutes and made feasible the exploration for domestic oil which had not been cost effective at lower prices of imported oil.[21] The end result is that total U.S. consumption of refined petroleum products fell by 13.5 percent from 34.8 quadrillion Btu per year in 1973 to 31.5 quadrillion Btu in 1984.[22] This cutback in oil consumption occurred at the same time the population grew by 11.6 percent and the economy by 30.7 percent in real terms.

---

[21]Domestic oil producers opened 15 percent more oil and gas wells in the first six months of 1980 than in all of 1973. See the Economic Report of the President, February 1981, p. 91.

[22]See Annual Energy Outlook 1984, U.S. Department of Energy, Energy Information Administration, January 1985, p. 203.

The data in Table 1 indicate that the elderly population was able to make these adjustments as "easily" as the rest of the population. Both groups increased the proportion of total consumption going to energy by about 38 percent. Both groups were able to reduce their energy-intensive appliance-related purchases by about 11 percent.

The next section discusses what can happen when the normal adjustment process via relative prices is not allowed to take place.

How Markets are Distorted

Markets place responsibility on individuals, who participate as both consumers and producers, to make choices about what is best for their particular situation. Allowing people to judge their own needs is the most effective means by which an economy can make decisions about what is to be produced and how the output is to be allocated. Once markets are subject to interference, their effectiveness is damaged along with the health of the overall economy.

Markets can be disrupted by government regulation and tax and spending programs. Advocates of government intervention justify interference in general because they believe: (1) a redistribution of resources within the economy is necessary; (2) that the government is a better forecaster of future demand and supply conditions; or (3) the market will not provide for future needs.

Let us relate these notions to the question of energy and the aged. This paper has already shown that no case can be made for greater redistribution to the elderly as a group. Arguments for intervention must therefore assume that the private sector somehow fails to provide for special energy needs of the elderly and must rely on a belief that the government can "do it better."

The overwhelming evidence is that economic demands, when technologically feasible, are best satisfied through the normal price mechanism. There are two factors which can inhibit the satisfaction of consumer demands, however: (1) the economic cost of supplying a given good or service; and (2) government intervention which either raises the cost of supply or prohibits an activity altogether. The first is inescapable. Costs reflect resource constraints which no amount of wishful thinking or government legislation can remove. Prohibitive costs mean that the resources that would have to be used in providing a given service could be put to more profitable use somewhere else.

The notion that a public authority should step in whenever a perceived "need" is "unsatisfied" because of prohibitive costs, however, completely neglects the economic realities of resource limitations. It further assumes that the government can always "rectify" the situation. A review of the federal government's response to the oil crises of the 1970s clearly invalidates this claim.

In the 1970s, the federal government embarked on a policy of increasing federal regulation of energy, including the control of domestic oil prices. Control of domestic oil prices was an attempt to keep gasoline "affordable" by not allowing the price of domestic oil to rise with the price of imported oil. This attempted redistribution from domestic oil producers to consumers reduced the incentives for domestic producers to increase domestic supply. Economic advisors of both the Carter and Reagan administrations agree that government programs during the 1970s actually reduced the ability of the United States to respond to supply disruption and the rapid price increases that occurred.[23] Supply adjustments returned to normal in 1981 with the removal of price controls and other energy regulations.

The federal government also seriously considered distributing ration coupons for gasoline as a response to supply disruptions. The justification for this non-price rationing mechanism was again primarily on the basis of affordability. In fact, rationing represents an abridgment of individual property rights. A person who valued gasoline highly would have had his right to wait in line or pay the higher price transferred to another person who did not value gasoline as much.

This non-market solution is self-defeating.[24] A potential black market inevitably develops in rationing situations. Coupon holders that would not otherwise pay the higher price for gasoline have an incentive to trade their coupons to persons who would pay the higher price given the chance. If this trading were allowed to occur, buyers would return to their demand schedules. The effective price paid for gasoline, however, would now be higher than the price that would have occurred under a freely operating market. In addition, wealth would be redistributed according to some bureaucratic notion of "fairness."

---

[23]See the Economic Report of the President, February 1981, pp. 89-90 and Budget of the United States Government, Fiscal Year 1983, p. 5-41.

[24]The 1981 Economic Report (pp. 94-99) recognized the problems with rationing.

Resources are wasted in setting up the rationing coupons and in maintaining a superfluous market. Even if no market in coupons (white or black) develops, however, resources are wasted since the government controls obscure the appropriate price signals. A price increase is a signal that for some reason a particular product, in this case oil, has become more expensive. The appropriate response is not only to reduce use of the product but to make sure that whatever is used is put to the most productive work. The tried-and-true test for the most productive use of a resource is how much the potential users are willing to pay.

Inefficiencies are not limited to regulations. Government spending programs also interfere with the market process. Whether financed by debt or taxes, government spending preempts resources from the private sector economy. This preemption raises the costs of production and decreases the aggregate supply of private output. In the course of trying to take from one group and give to another, the total output that could be produced by the economy is reduced.

An example of this type of government intervention is in the area of synthetic fuels. In 1980 the federal government set up the Synthetic Fuels Corporation to create a synfuels industry. Of the 129 projects presented to the corporation only a dozen or so are still under consideration. The largest project, the Great Plains coal gasification plant in North Dakota, is uneconomical and has recently defaulted on $1.5 billion in federally guaranteed construction loans. Last year the Congress took back $5 billion in funding, and this August the House of Representatives voted 312 to 111 to take back all remaining funds.[25]

One of the basic problems the Corporation ran into was an incorrect government price forecast. Unexpected falling prices for oil and higher than estimated costs of development for synthetic fuel facilities have made the operation uneconomical. Government intervention has been unsuccessful in creating a new industry, has diverted real resources from productive use in the private sector, and has added billions of dollars to the federal deficit and the national debt.

---

[25]Robert D. Hershey, Jr., "Synfuels Is Running on Empty", The New York Times, August 25, 1985.

Those who advocate government interference through tax and spending policies assume that the government knows more about what the people want than the people themselves and that it is a better forecaster than the market. The Annual Energy Outlook, 1984 provides another excellent illustration of the pitfalls of projecting energy needs and costs into the distant future. The energy market has been very volatile since the initial oil shocks in the early 1970's. The price of imported crude rose from $4 a barrel in 1973 to $29 ten years later.[26] Prices over the past several years have fallen from the high point of $39 a barrel to the current level of $26 from several of the non-OPEC countries. Just as with the rapid run-up in price, none of these recent price declines were anticipated by forecasters until the actual change was observed. The 1984 report estimates that the world price for oil imports was $30, down by more than 25 percent from their forecast of the year before.[27] Six months after the report was published prices had fallen by an additional 15 percent. Unanticipated price swings of 40 percent call into question the usefulness of long range forecasts and plans based on them. The best policy to follow is to let individuals respond to changing conditions. While everyone will not guess correctly, it is far better than to force the economy into a government-imposed straightjacket.

---

[26] Annual Energy Outlook 1984, p. 6.

[27] Annual Energy Outlook, p. 187.

Conclusions and Recommendations

Concern about the future energy needs of the elderly has been expressed in some quarters. This concern centers on two notions. First, some believe that the elderly are economically less well-off as a group and that this lower economic status justifies government policies and programs on the basis of age. The recent data presented in this paper, however, show that the elderly are the most economically well-off relative to other age groups in our economy. On average, they have one-third more after-tax income per household member and three times the financial assets as do members of the baby boom generation (now between the ages of 30 and 40).

Furthermore, the economic status of future retiring cohorts should continue to improve because of increasing real levels of social security benefits and the growth in private pensions. As time goes on, the social security program, which provides both cash and medical benefits, will require more and more resources from the private sector economy to pay the benefits now promised by law. Today social security transfers a little over 6 percent of GNP and 13.5 percent of wages and salaries. By 2010, when the baby boom generation begins to retire, social security benefits will amount to 8 percent of GNP and 17 percent of total wages and salaries. By 2035 social security will claim 12.4 percent of GNP and almost 27 percent of wages and salaries.

Thus, the evidence indicates that the elderly will continue to be in an economically advantageous position relative to the rest of the population. Because of the high level of taxation to be borne by workers to provide currently promised social security benefits, additional government spending targeted on the elderly as a group is not affordable.

---

[28]This amounts to almost twice the official poverty threshold for a single aged person and three times the poverty threshold for an aged couple. Social Security outlays directed toward the elderly account for 93 percent of the transfer. Also included are civil service, military, and railroad retirement; the extra income tax exemption for the elderly; and the tax credit for the elderly.

In 1984, the federal budget spent over $9,300 per person age 65 and over in direct outlays and tax expenditures.[28] The fact that there are still some elderly poor indicates that existing government programs have not been very efficient. A restructuring of, not more, federal expenditures for these programs is the appropriate response to the call for additional energy assistance to the elderly poor.[29]

Second, some are concerned that the energy needs of the elderly are different from the rest of the population and that these special needs will not be met by the market. Data from the 1972-73 and 1980-81 Bureau of Labor Statistics Consumer Expenditure Surveys indicate that total energy expenditures are not much different for older households versus the population as a whole. Differences in expenditure patterns are more likely due to income level and region than age.

Whatever the energy demands of the elderly, or any other age group, the unregulated price mechanism is the best way to meet the needs of consumers in the most cost-effective way. Today everyone recognizes the failure of government energy regulation policy in the 1970s, which actually made the country more vulnerable, and the contrasting success of deregulation.

Attempts at forecasting changing conditions in order to somehow prepare for them fail miserably. For example, no one could predict the use of oil in place of coal or the widespread use of air conditioning and with it the rapid growth of the South. Trying to outguess the market results in a misallocation of resources such that too much of one product is produced and not enough of another.

The growth in the proportion of the population that is elderly will occur gradually over several decades. There is plenty of time for any needed adjustments to take place. Comprising some 20 percent of the population, the wants of the elderly will definitely be heard.

---

[29]There is an existing low-income home energy assistance program which provides block grants to states to help pay the fuel bills of low-income families. In 1984, the Federal government spent $2.0 billion on this program and has budgeted $2.1 billion for 1985. This program is not exclusively for the elderly and was not included in calculating the $9,300 number.

Rather than undertake the fruitless task of trying to guess which line of research to follow or which energy source to develop, the most effective policy the government can undertake is to assure that markets can operate freely. This means further deregulation of areas involving the supply of energy so that barriers to entry are reduced and so that prices reflect the true costs of inputs into, and output from, the production process.

It also means adopting policies that will foster economic growth. The demographic profile of the United States is essentially determined for the next several decades. Low fertility rates and improving mortality rates mean that the proportion of the population that is age 65 and over (and age 85 and over) will grow. As retirees become a larger proportion of the population, the labor force becomes a smaller proportion. The only way the standard of living of a population with a shrinking work force can be maintained, let alone improved, is for labor to become increasingly productive. This requires more capital per worker. Higher capital-to-labor ratios mean higher productivity, higher real wages for workers, a larger tax base and higher GNP.

Historical evidence also indicates that periods of capital expansion generally spawn periods of rapid technological change. Energy is a capital-intensive industry which would certainly benefit from newer and better technology.

The government should adopt policies which encourage overall capital formation. The major determinant of the rate of capital formation is the cost of capital. Of all variables under direct policy control, taxation is the major determinant of the cost of capital.[30] In addition to continuing deregulation of energy markets, the government should change tax law to reduce the cost of capital. These changes include exempting from tax interest and dividend income at the personal level and expensing of capital assets.[31] Policies such as these would lower the cost of using capital and reduce the tax bias that currently favors consumption over investment.

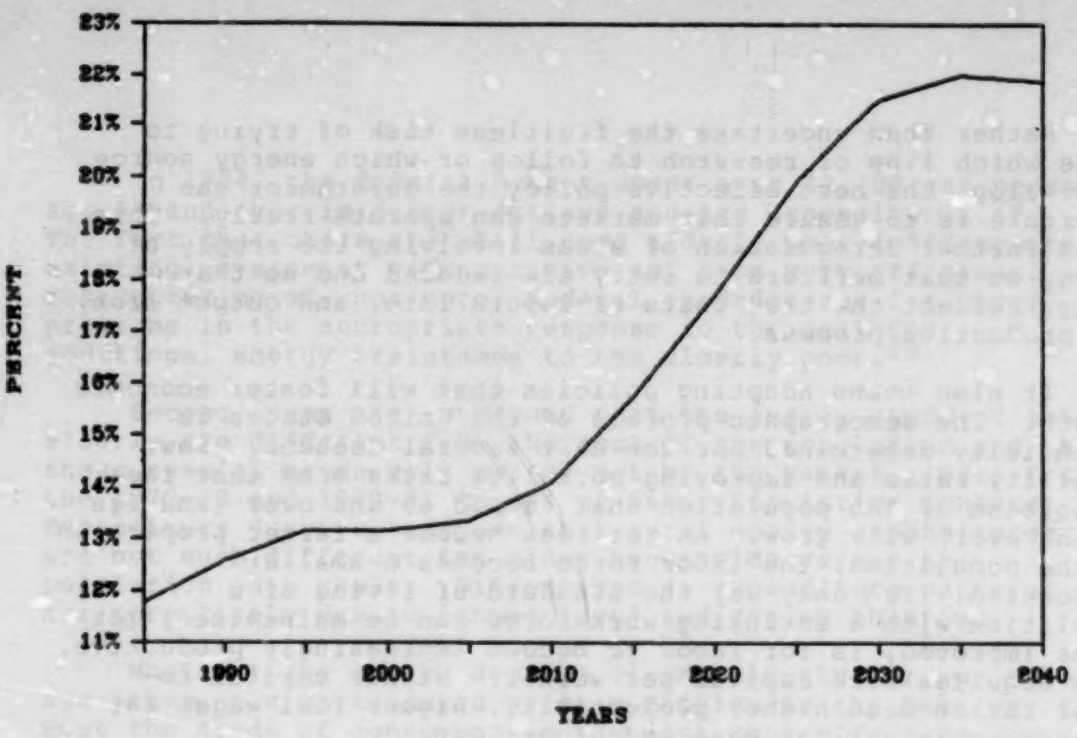
---

[30] D. Brazell, A. Robbins, G. Robbins, and P.C. Roberts, The Cost of Corporate Capital in the United States and Japan, The Institute for Political Economy and The Krieble Foundation, scheduled for October 1985.

[31] Expensing permits the immediate deduction of the purchase price of a real capital asset, such as equipment or structures.

Plate 1

AGED AS A SHARE OF TOTAL POPULATION



BENEFITS NOW PROMISED TO AGED

BY SOCIAL SECURITY

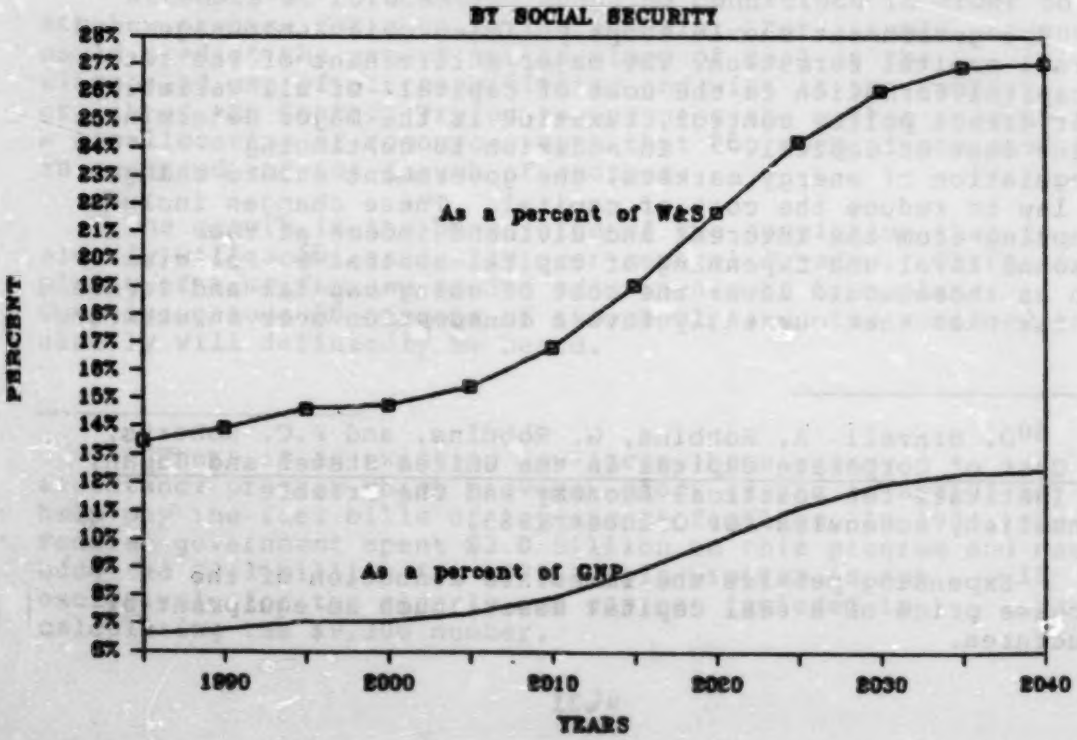
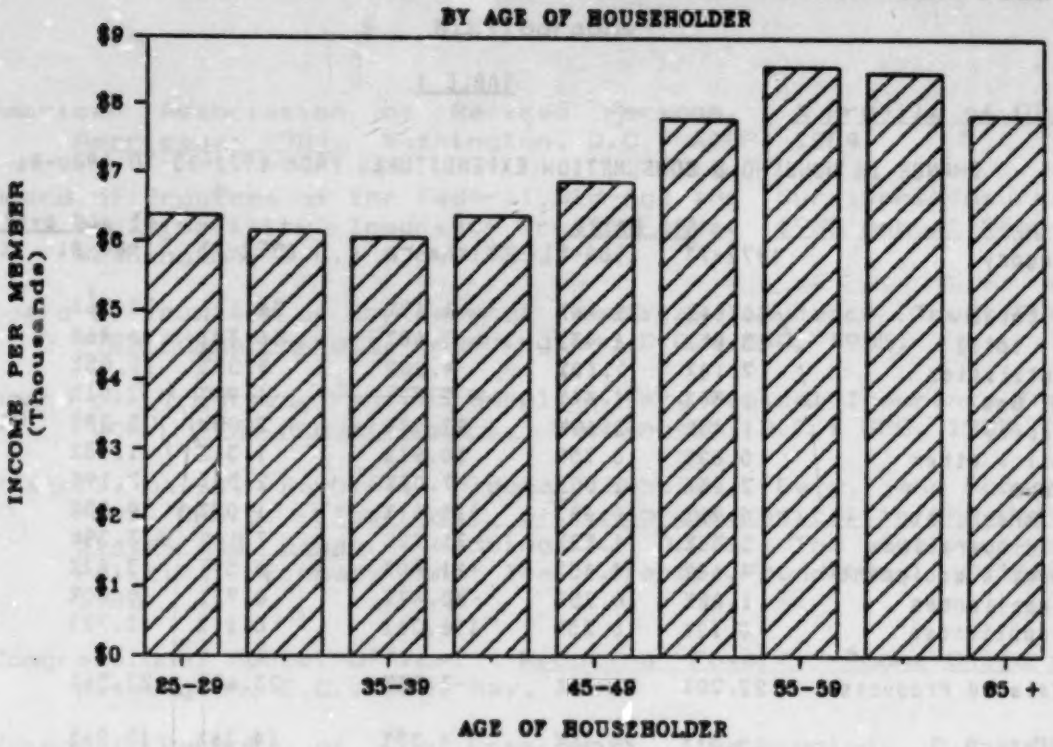


Plate 2

1982 AFTER-TAX INCOME PER CAPITA

BY AGE OF HOUSEHOLDER



1983 MEDIAN HOUSEHOLD FINANCIAL ASSETS

BY AGE OF HOUSEHOLDER

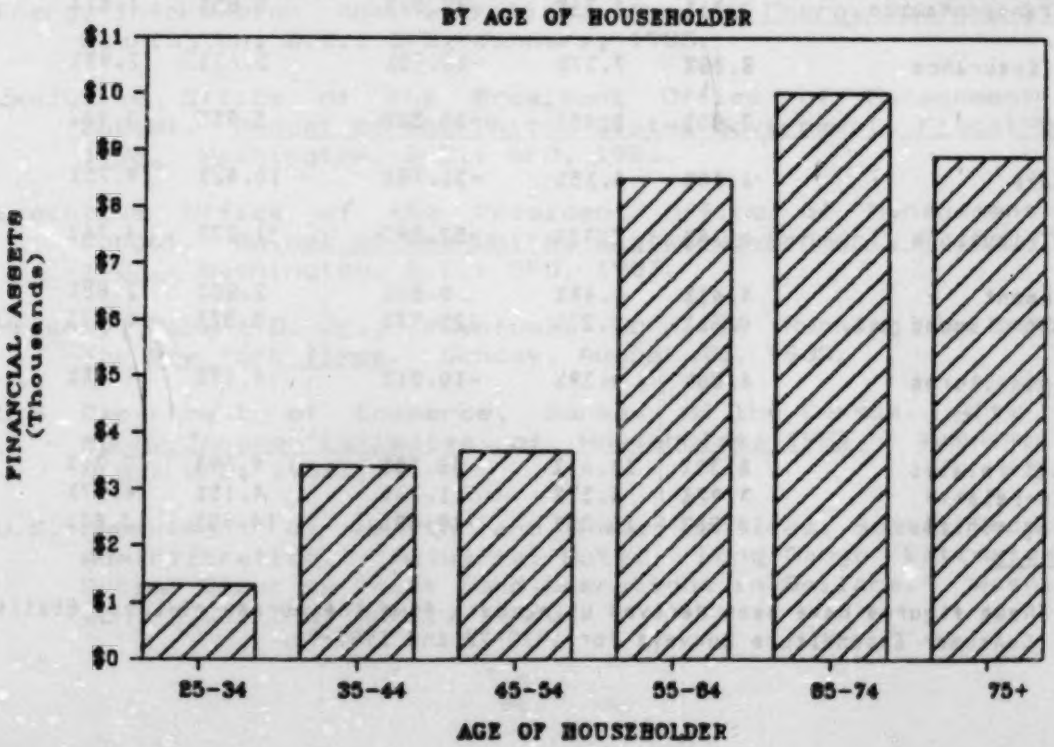


TABLE 1

CHANGE IN HOUSEHOLD CONSUMPTION EXPENDITURES FROM 1972-73 TO 1980-81

Category	All Units			65 and over		
	1972-73	1980-81	% change	1972-73	1980-81	% change
Housing, total	30.84%	29.46%	-4.48%	34.13%	33.26%	-2.54%
Shelter, total	15.85%	16.43%	3.60%	16.35%	16.46%	0.67%
Fuel & utilities	7.10%	7.40%	4.20%	9.58%	10.05%	4.92%
Natural Gas	1.30%	1.34%	2.82%	1.98%	2.01%	1.24%
Electricity	1.43%	2.62%	83.54%	2.08%	3.28%	57.62%
Fuel oil & other	0.68%	0.75%	10.81%	1.31%	1.73%	31.80%
Telephone	2.15%	2.00%	-7.05%	2.55%	2.19%	-14.24%
Water, trash, etc	0.76%	0.64%	-15.41%	1.02%	0.85%	-16.98%
Household operations	5.36%	1.52%	-71.72%	7.16%	3.28%	-54.13%
Housefurn. & equipment	4.68%	4.15%	-11.40%	3.59%	3.47%	-3.45%
Major appliances	1.08%	0.75%	-30.47%	0.92%	0.80%	-13.44%
Small appliances	0.12%	0.35%	196.26%	0.11%	0.32%	188.13%
Food & Related Products	22.20%	21.46%	-3.33%	23.62%	22.56%	-4.49%
Transportation	19.31%	20.15%	4.33%	14.36%	15.86%	10.46%
Vehicle purchases	8.52%	6.85%	-19.62%	5.00%	4.35%	-12.95%
Vehicle finance	0.96%	0.83%	-14.00%	0.77%	0.24%	-68.75%
Vehicle operations	9.07%	11.15%	22.96%	7.75%	9.66%	24.74%
Gasoline	4.20%	6.85%	63.07%	3.18%	5.69%	79.02%
Other	4.87%	4.30%	-11.68%	4.57%	3.97%	-13.05%
Other transportation	0.76%	1.31%	72.87%	0.85%	1.61%	88.64%
Personal insurance	8.88%	7.37%	-16.95%	3.62%	2.99%	-17.27%
Apparel	7.83%	5.45%	-30.32%	5.95%	3.92%	-34.10%
Health Care	6.38%	4.35%	-31.78%	10.42%	9.75%	-6.48%
Cash contributions	6.14%	2.92%	-52.39%	11.23%	4.74%	-57.78%
Entertainment	4.41%	4.44%	0.86%	2.80%	2.88%	3.04%
Television, sound etc.	0.56%	1.27%	125.97%	0.57%	0.97%	69.72%
Other expenditures	4.88%	4.39%	-10.01%	4.17%	4.04%	-3.23%
Total Fuel-related	8.39%	11.61%	38.35%	9.19%	12.71%	38.28%
Appliance-related including vehicles	3.92%	4.37%	11.73%	4.15%	4.27%	2.81%
	18.26%	16.35%	-10.48%	14.49%	12.83%	-11.45%

Note: These figures have been derived using data from the Bureau of Labor Statistics Consumer Expenditure Surveys for 1972-73 and 1980-81.

Bibliography

American Association of Retired Persons. A Profile of Older Americans: 1984. Washington, D.C.: AARP, 1984.

Board of Trustees of the Federal Old-Age and Survivors Insurance and Disability Insurance Trust Funds. 1985 Annual Report. Washington, D.C.: GPO, 1985.

Board of Trustees of the Federal Hospital Insurance Trust Fund. 1985 Annual Report. Washington, D.C.: GPO, 1985.

Board of Trustees, Federal Supplementary Medical Insurance Trust Fund. 1985 Annual Report. Washington, D.C.: GPO, 1985.

Brazell, David, Robbins, Aldona, Robbins, Gary, and Roberts, Paul Craig. The Cost of Corporate Capital in the United States and Japan. Washington, D.C.: The Institute for Political Economy and The Krieble Foundation. October, 1985.

Congressional Budget Office. Reducing Poverty Among Children. Washington, D.C.: CBO, May, 1985.

Economic Report of the President. Washington, D.C.: GPO, February, 1983.

Economic Report of the President. Washington, D.C.: GPO, February, 1981.

Energy Information Administration. Annual Energy Outlook 1984. Washington, D.C.: GPO, January, 1985.

Executive Office of the President Office of Management and Budget. Budget of the United States Government, Fiscal Year 1986. Washington, D.C.: GPO, 1986.

Executive Office of the President Office of Management and Budget. Budget of the United States Government, Fiscal Year 1983. Washington, D.C.: GPO, 1983.

Hershey, Robert D. Jr., "Synfuels Corp. Is Running on Empty." The New York Times. Sunday, August 25, 1985.

U.S. Department of Commerce, Bureau of the Census. After-Tax Money Income Estimates of Households: 1982. Washington, D.C.: GPO, 1984.

U.S. Department of Health and Human Services, Social Security Administration. "Actuarial Note: Long-Range Estimates of Social Security Trust Fund Operations in Dollars." Washington, D.C., GPO, April, 1985.

U.S. Department of Housing and Urban Development, Office of Policy Development and Research. How Well Are We Housed? 4. The Elderly. Washington, D.C.: GPO, May, 1979.

U.S. Department of Labor, Bureau of Labor Statistics. Consumer Expenditure Survey: Integrated Diary and Interview Survey Data, 1972-73. Washington, D.C.: GPO, 1978.

U.S. Department of Labor, Bureau of Labor Statistics. Consumer Expenditure Survey, Interview Survey, 1980-81. Washington, D.C.: GPO, April, 1985.

ENERGY AND THE AGING: HOME HEATING AND COOLING

by: Robert L. Clark*
Edward W. Erickson**

Introduction

Energy costs increased substantially during the 1970s. The focal events were the embargo-related crude oil price increases of 1973-74 and the further oil price increases that followed the Iranian revolution in 1979. Even before these events, the world oil market had begun to tighten causing prices to rise, and the whole decade of the 1970s was tumultuous. The price of crude oil is a bellwether for general energy costs, but other energy markets also were unsettled during the 1970s for additional reasons often specific to their own particular circumstances.

Regulation-induced shortages of natural gas in the United States aggravated adjustment processes in all energy markets. A quarter century of substantial improvements in the thermal efficiency of electrical generation hit the thermodynamic limit. Nuclear power took longer to bring on stream than had been planned, proved less reliable than had been anticipated and did not prove to be too cheap to meter. Coal usage has been limited to larger boilers because of storage and handling costs, and environmental compliance has made coal-fired Btu's more expensive than the energy content of the raw coal itself. Unconventional alternative sources of direct energy supply generally have not been cost effective, even in competition with higher real prices for conventional supplies.

---

*Professor of Economics and Business, North Carolina State University.

**Director of the Center for Economic and Business Studies and Professor of Economics and Business, North Carolina State University.

Although initially hampered severely by regulatory impediments, energy markets have been adjusting. Price-induced conservation has reduced energy demands substantially from previously projected levels. A principal component of conservation savings has been reduced use of energy per unit of activity through improved utilization efficiencies. These improved efficiencies occur largely as a result of capital stock adjustments. Such adjustments are a time-intensive process that plays out over many years as, for example, the appliance stock turns over and the housing stock is remodeled and replaced. The price-induced conservation adjustment process to reduce energy demands occurs worldwide in all economic sectors. This adjustment process has taken time, has created substantial demand savings, and is not yet complete.

Energy supply experience for oil and gas generally has also been better than expected. U.S. crude oil production has been relatively stable and has not yet declined. U.S. natural gas reserves have also been stable and current production capacity somewhat exceeds demands on the system. Soviet production has been maintained. Soviet natural gas displaces crude oil in Europe. North Sea gas is an important substitute for oil. A variety of nonOPEC new sources of crude oil have come on stream over the last decade. OPEC's share of the world oil market has declined and its crude oil production is considerably less than capacity. OPEC penetration of the petrochemical market using natural gas as a feedstock backs nonOPEC natural gas out of these uses and into competition with OPEC oil as a source of boiler fuel for large demanders of Btus.

The aggregate cumulative effect of all these supply and demand adjustments has caused the oil and gas price declines experienced so far in the 1980s. Further real price declines are widely considered to be likely and current levels of nominal oil and gas prices are under pressure as well.

The impacts of higher energy prices have affected all sectors and age groups. Adjustments have been widespread. We focus here upon energy consumption by the elderly. The questions we address are:

-- Do elderly households spend larger shares of their expenditures upon energy for residential heating, cooling and other uses than do younger households?

-- How does the share of household expenditures for energy behave as income increases within standard age groups?

-- What are the income elasticities for household energy consumption by age groups and is there a pattern in these elasticities across age groups?

-- How do standard demographic variables other than age affect the share for energy costs in total household expenditures?

-- Are there regional patterns and city size effects on the share of energy costs in total household expenditures?

-- Do regional patterns and city size effects vary across age groups?

-- How do energy expenditure shares, income elasticities, demographic effects, regional patterns and city size effects change as energy prices dramatically change for the years 1972 and 1973 vs. the year 1979?

-- How are underlying energy usage patterns, fuel mixes and relative prices apt to have affected these patterns?

-- In an era of falling real prices what implications for the elderly can be drawn from the patterns that emerged from the initial period of rising energy prices?

These questions are addressed against a background of considerable research on the general expenditure patterns of the elderly.

Clark, et al. (1984) find that in 1972-73 expenditure patterns change with household age. The share of total expenditures allocated to food, housing, and health and personal care rise with age even though actual expenditures decrease. These increases in budget shares were offset by declining proportions of total expenditures allocated to apparel, transportation, recreation, insurance and pension contributions, and taxes. Clearly these changes are not just a function of aging but also reflect changes in income and average household size.

Using only 1973 Consumer Expenditure Survey (CES) data, Schrimper and Clark (1985) estimate commodity budget shares as a function of several socioeconomic variables. Their findings indicate that food, housing and health care have income elasticities less than one so that declining income with age contributes to the rising budget shares for these items. In general, their results do not indicate that retirement status has a significant effect on expenditure patterns when income and age are included in the regression equation. They also report that the income elasticities on these items rise with age.

Although Schrimper and Clark (1984) did not examine household expenditures for residential energy use for heating and cooling and other uses, they did examine total expenditures on housing. They found that the housing budget share rose with age and, as noted above, housing expenditures became more sensitive to income changes at older ages.

Household Energy Expenditures

Household expenditures may vary with age because of changing consumer preferences that coincide with aging or in response to changing economic and health status. To investigate possible differences in consumption patterns with age, we examined data from the 1972-73 Consumer Expenditure Survey (CES) and the 1979 Residential Energy Consumption Survey (RECS). Each of these surveys contains information on household energy expenditures and a series of socioeconomic variables. For this analysis, households in which the head was 45 years of age or older were grouped into eight five-year age categories and a final category for households whose head was 85 or older.

For each household, total expenditures for energy consumption were determined by aggregating expenditures on the different types of energy consumed in the home. An energy budget share for home heating and cooling and other uses within the home was calculated by dividing nontransportation energy expenditures by total household expenditures on all items including taxes as reported in the CES. For the RECS data, energy expenditures were divided by household income. In the RECS survey, income is reported only within income ranges, thus we estimated household income to be the midpoint of the reported income range. Respondents in the open-ended income category of $50,000 and greater were deleted. The household budget shares form the basis for the tabular summary of our analysis which follows, although we also examined expenditures directly.

Tables 1 through 9 report results for a set of regressions in which energy expenditures as a share of either total household expenditures (CES) or household income (RECS) are the dependent variables. The independent variables are measures of total household expenditures (CES) or income (RECS); the number of household members; race, sex and marital status; retirement status; region; and city size. Tables 1,3, 4, 6 and 8 are based upon CES data and report the results for two separate budget share regressions (one for 1972 and one for 1973). Tables 2, 5, 7 and 9 report equivalent results for the budget share regression using RECS data for 1979.

Energy Budget Shares for the Aging

The first two columns of Table 1 and the first column of Table 2 show the unweighted average energy budget share for respondents in these surveys by age. For both 1972 and 1973 (CES) and for 1979 (RECS), the budget shares rise with advancing age. In 1972 and 1973, the energy budget share rises from 3.7 percent of total expenditures for households aged 45-49 to approximately 10.5 percent of expenditures for households aged 85 and over.

A simple regression of the average budget share as a function of age indicates that these budget shares are significantly different from each other and that aging from one five-year age group to another is associated with an increase in the household energy budget share of 0.9 percentage points.

Table 1. Some Dimensions of Household Energy Expenditures by Age in 1972 and 1973

Age Group	Household Energy Expenditure Share		Coefficient on Ln (Total Household Expenditure) in Share Regression		Energy Income Elasticity	
	1972 %	1973 %	1972	1973	1972	1973
45-49	3.71	3.68	-0.024***	-0.023***	0.353	0.369
50-54	3.86	4.07	-0.030***	-0.030***	0.213	0.252
55-59	4.60	4.20	-0.037***	-0.032***	0.193	0.229
60-64	5.05	4.96	-0.035***	-0.032***	0.308	0.350
65-69	6.59	6.31	-0.044***	-0.039***	0.334	0.374
70-74	7.83	7.11	-0.045***	-0.046***	0.425	0.349
75-79	8.43	8.36	-0.045***	-0.068***	0.467	0.279
80-84	9.48	9.32	-0.055***	-0.055***	0.420	0.413
85+	10.36	10.66	-0.052***	-0.052***	0.500	0.512

Source: BLS Consumer Expenditure Survey data

* indicates significant at .10 level
** indicates significant at .05 level
*** indicates significant at .01 level

Table 2. Some Dimensions of Household Energy Expenditures by Age in 1979

Age Group	Expenditure Share (%)	Coefficient on Ln (Total Household Income) Share Regression	Energy Income Elasticity
45-49	6.22	-0.091***	-0.459
50-54	6.14	-0.068***	-0.114
55-59	6.90	-0.072***	-0.044
60-64	6.67	-0.078***	-0.169
65-69	10.99	-0.095***	0.140
70-74	12.41	-0.117***	0.059
75-79	11.79	-0.104***	0.118
80-84	13.40	-0.109***	0.189
85+	15.05	-0.158***	-0.050

Source: EIA, Residential Energy Consumption Survey data.

* indicates significant at .10 level
** indicates significant at .05 level
*** indicates significant at .01 level

For the RECS sample, the budget shares are somewhat higher but the age pattern remains. Regression coefficients indicate that aging from one age group to another is associated with an increase in the household energy budget share of 1.2 percentage points.

The CES regressions for 1972 and 1973 and the RECS regression for 1979 are:

(1) 1972 Budget Share = 0.0216 + 0.009 Age,
(2) 1973 Budget Share = 0.0201 + 0.009 Age,
(3) 1979 Budget Share = 0.039 + 0.012 Age.

Where age is a variable indicating the age group of the household, i.e., household with heads aged 45 to 49 have an age value of 1, households with heads aged 50 to 54 have an age value of 2, etc.

Income Elasticities for Energy Consumption of the Elderly

In addition to allocating a significantly larger portion of their family budget to energy consumption, older households may respond differently to changes in their economic status than younger households. To test this hypothesis along with examining other determinants of energy consumption, we estimated budget share equations using ordinary least squares. The energy budget share was estimated as a function of the log of total household expenditures, race, sex, marital status, retirement status, family size, region, and city size. The share equations were estimated separately for each age group and then the entire sample was pooled and the appropriateness of pooling was tested.

For both data sets, the coefficients were found to be significantly different across the age groups. Thus, pooling the entire sample is not justified, indicating that older households respond in a significantly different manner than younger households to changes in these variables.[1]

The regression results suggest that total expenditures or income is a very important determinant of the energy budget share. The estimated coefficients for this variable are shown in columns 3 and 4 of Table 1 and column 2 of Table 2. The coefficients on the natural logarithm of total expenditures is significant at the 1 percent level in every equation.

---

[1]The test for appropriateness of pooling samples is an F test with degrees of freedom being the number of restrictions placed on the coefficients in the restricted equation (R) and degrees of freedom in the unrestricted equations (DF). The value of F is found by the equation

$$F_{R, DF} = \frac{(SSE_R - SSE_u)/R}{SSE_u/DF}$$

where SSE_R is the sum of squares of errors in the restricted equation and SSE_u is the sum of squares of errors in the unrestricted equations. The restricted equation refers to the pooled sample which restricts the estimated coefficients to be equal while the unrestricted equations allow coefficients to be estimated separately for each age group.

The negative coefficients indicate that as total expenditures rise, the portion allocated to energy consumption falls. Related analyses show that energy consumption rises with increases in total expenditures but at a slower rate. Income or expenditure elasticities are calculated based on the estimated coefficients and the household budget shares.[2] These values are shown in the last columns of Tables 1 and 2. For the respondents in the CES, the elasticities are very small at the younger ages ranging between 0.2 and 0.3. The expenditure elasticity rises with age and reaches 0.5 for the oldest age group. These results show that older households spend larger portions of their budgets on home energy consumption and that their consumption of energy is more sensitive to income changes than younger households.

Similar general conclusions are reached using the RECS data. As age rises, the general pattern is for elasticities to increase algebraically. However, the implied elasticities for the younger households are actually negative so that for these consumers energy is an inferior good. This is a result we do not believe. Adding to our skepticism are results of the regressions for the dollar value of energy consumption. In these equations, as in the equations (not shown), based on CES data reported in Table 1, expenditures on energy consumption rise with income.

The negative income elasticities may be due to the mechanics of creation of the income variable in the RECS data. In the CES data set, total household expenditure rather than household income was the basis upon which energy expenditure shares were calculated. Total household expenditure is available in the CES data as a continuous variable. In the RECS data, income is specified in terms of a set of categories defined over nonuniform intervals. The

---

[2]The income or expenditures elasticity for each age group is derived from the following relationship: the elasticity equals one plus (estimated coefficient of the natural logarithm of total expenditure variable divided by the energy budget share for that age group).

midpoints of these intervals were used as the measure of income for the RECS data. In addition, energy consumption data for the highest income consumers was omitted because the income bracket for this group is open-ended.[3] We believe that further investigation would show that these technical considerations are responsible for the anomalous negative income elasticities for lower age groups in Table 2.

---

[3]There are techniques such as use of maximum likelihood estimators that allow data from open-ended brackets to be used. Because of time limitations, however, we did not attempt to incorporate such refinements in this analysis.

General Socioeconomic Effects

Other regression results for the socioeconomic and location variables are shown in Tables 3 - 5 and Tables 6 - 9 respectively. For the most part, the other socioeconomic variables do not seem to be uniformly significant determinants of the portion of household expenditures devoted to energy consumption. For the younger age groups, the coefficients on the family size variables are signficant and positive, indicating energy expenditures rise with family size. Although the family size coefficients remain positive, as expected, at the older ages, they are not significantly different from zero.

In only five of eighteen cases is retirement status statistically significant for the 1972 and 1973 regressions based on CES data. In each of these instances, retirement is associated with an increase in the budget share for household energy expenditures for heating and cooling. Retirement status is not a statistically significant determinant of the budget share of energy expenditures for any age group in the 1979 regression based on RECS data.[4]

Table 6 shows that for the CES sample, families in larger cities tend to have smaller energy budget shares; however, this result does not hold for the RECS data shown in Table 7. Significant regional variation is observed in both samples. Households in the Northeast and North Central regions spend a larger portion of their family budgets on energy consumption patterns than families in the West, whereas energy consumption of families in the South do not deviate from those of similar families living in the West.

---

[4]In the RECS data, retirement status was not explicitly indicated. As a proxy for retirement status in the RECS data, we have used whether or not the head of the household is employed.

Table 3. Socioeconomic Effects in the Household Energy Expenditure Share Equations for 1972

Share Equation Coefficients

Age Group	Nonblack	Single Male	Single Female	Retired	Family Size
45-49	.0034	-.0120***	.0011	.0331***	.0014***
50-54	.0030	-.0113***	-.0047**	.0125***	.0017***
55-59	.0075*	-.0095**	.0004	-.0017	.0021***
60-64	-.0022	-.0117**	-.0036	.0081**	.0016
65-69	-.0048	-.0095	.0018	.0006	.0669***
70-74	.0002	-.0045	-.0022	-.0043	.0038
75-79	-.0133	-.0085	-.0086	.0026	.0019
80-84	-.0117	-.0015	.0045	-.0156	.0013
85+	.0151	-.0324	-.0278	.0068	-.0025

Source: BLS, Consumer Expenditure Survey data.

* indicates significant at .10 level
** indicates significant at .05 level
*** indicates significant at .01 level

Table 4. Socioeconomic Effects in the Household Energy Expenditure Share Equations for 1973

	Share Equation Coefficients				
Age Group	Nonblack	Single Male	Single Female	Retired	Family Size
45-49	-.0050*	-.0074**	.0010	-.0050	.0009***
50-54	-.0075***	-.0060*	.0002	.0079*	.0032***
55-59	.0030	-.0015	-.0054**	.0060*	.0018***
60-64	-.0036	-.0013***	-.0024	-.0047	.0009
65-69	.0019	-.0088	.0038	.0007	.0005
70-74	-.0069	-.0206**	-.0009	.0042	.0007
75-79	.0012	.0051	-.0078	-.0033	.0058
80-84	.0088	.0076	.0024	-.0053	.0104
85+	-.0247	-.0054	-.0180	-.0043	-.0040

Source: BLS, Consumer Expenditure Survey data.

* indicates significant at .10 level
** indicates significant at .05 level
*** indicates significant at .01 level

Table 5. Socioeconomic Effects in the Household Energy Expenditure Equation for 1979

Share Equation Coefficients

Age Group	Nonblack	Single Male	Single Female	Retired	Family Size
45-49	0.015	-0.012	0.005	-0.015	0.006***
50-54	-0.006	-0.010	0.017**	-0.002	0.005***
55-59	-0.001	-0.003	0.002	0.002	0.013***
60-64	0.013	0.012	0.014*	-0.004	0.020***
65-69	-0.036**	-0.004	-0.005	-0.020	0.012***
70-74	-0.071**	-0.056**	0.022	-0.013	0.023**
75-79	0.018	0.003	0.002	-0.024	0.036**
80-84	0.026	0.051	0.067**	-0.032	0.047*
85+	0.012	0.100*	0.034	0.009	0.060*

Source: EIA, Residential Energy Consumption Survey

* indicates significant at .10 level
** indicates significant at .05 level
*** indicates significant at .01 level

Table 6. Regional Differences by Age in the Household Energy Expenditure Equations for 1972 and 1973

Coefficients for Regional Dummy Variables

	North East		North Central		South	
Age Group	1972	1973	1972	1973	1972	1973
45-49	.0169***	.0103***	.0123***	.0069***	.008***	.0028
50-54	.0128***	.0094***	.0105***	.0080***	.0065***	.0020
55-59	.0155***	.0165***	.0122***	.0092***	.0038	.0050**
60-64	.0151***	.0147***	.0142***	.0121***	.0053	.0056*
65-69	.0285***	.0297***	.0204***	.0205***	.0025	.0123***
70-74	.0273***	.0286***	.0245***	.0218***	.0044	.0127*
75-79	.0471***	.0363***	.0376***	.0266***	-.0010	.0006
80-84	.0399***	.0181	.0547***	-.0059	.0099	-.0088
85+	.0391*	.0291	.0423*	.0168	.0226	-.0074

Source: BLS, Consumer Expenditure Survey data.

* indicates significant at .10 level
** indicates significant at .05 level
*** indicates significant at .01 level

Note: The West is the base for the regional dummy variables. The coefficients above show differences by region from the intercept for the West.

Table 7. Regional Differences by Age in the Household Energy Expenditure Share Equations for 1979

Coefficients for Regional Dummy Variables

Age Group	North East	North Central	South
45-49	-0.004	-0.00	-0.023**
50-54	0.026***	0.024***	0.003
55-59	0.023***	0.033***	0.015***
60-64	0.034***	0.033***	0.016**
65-69	0.051***	0.025*	0.019
70-74	0.112***	0.062***	0.048**
75-79	0.083***	0.002	0.010
80-84	0.046*	0.052**	0.035
85+	0.081	0.017	0.010

Source: EIA, Residential Energy Consumption Survey data.

* indicates significant at .10 level
** indicates significant at .05 level
*** indicates significant at .01 level

Note: The West is the base for the regional dummy variables. The coefficients above show differences by region from the intercept for the West.

Table 8. Effect of City Size in the Household Energy Expenditure Share Equations for 1972 and 1973

Age Group	SMSA 1,000,00 or Greater		SMSA 400,000-999,999		SMSA less than 400,000	
	1972	1973	1972	1973	1972	1973
45-49	-.0019	-.0043**	-.0031	-.0029	-.0017	-.0041*
50-54	-.0059***	-.0081***	-.0004	-.0080***	-.0047**	-.0039
55-59	-.0051**	-.0051***	-.0041	-.0047**	-.0017	-.0012
60-64	-.0029	-.0069***	-.0018	-.0064*	-.0005	-.0062*
65-69	-.0103***	-.0138***	-.0099*	-.0061	.0001	-.0092**
70-74	-.0189***	-.0048	-.0250***	-.0022	-.0149***	-.0001
75-79	-.0253***	-.0175***	-.0239**	-.0108	-.0063	-.0221***
80-84	-.0018	-.0187**	.0280*	-.0103	-.0086	-.0234*
85+	-.0491***	-.0076	-.0235	.0310	-.0419*	.0134

Source: BLS, Consumer Expenditure Survey data.

* indicates significant at .10 level
** indicates significant at .05 level
*** indicates significant at .01 level

Note: The base for these dummy variable coefficients is households not in SMSAs. The coefficients above show differences in the intercept for household energy expenditures for heating and cooling relative to households not in SMSAs.

Table 9. Effect of City Size in the Household Energy Expenditure Share Equation for 1979

Age Group	SMSA greater than 1,000,000	SMSA less than 1,000,000
45-49	0.002	0.010
50-54	-0.005	-0.006
55-59	0.014*	0.027***
60-64	-0.008	-0.002
65-69	-0.015	-0.005
70-74	0.005	0.014
75-79	-0.023*	-0.015
80-84	-0.020	-0.009
85+	-0.017	-0.010

Source: EIA, Residential Energy Consumption Survey data.

* indicates significant at .10 level
** indicates significant at .05 level
*** indicates significant at .01 level

Note: The base for these dummy variable coefficients is households not in SMSAs. The coefficients above show differences in the intercept for household energy expenditures for heating and cooling relative to households not in SMSAs.

Energy Price Changes and the Well-Being of the Elderly

The 1970s was a period of relatively high inflation. During this rise in the general level of prices, the price of energy was also rising relative to prices of most other commodities. Since the elderly spend a larger percentage of their budget on household fuel than other families, increasing relative energy prices adversely affect the relative real income of elderly households. Our regression results show that older households also have higher income elasticities than younger households. These two findings suggest that the income effect of rising energy prices will lead the elderly to reduce their purchases of energy by more than other age groups. Of course, the total response to rising prices also includes a substitution effect and we have no direct evidence on the age-specific substitution effects.

One cannot simply look at the budget shares at the time of the surveys to test the hypothesis that older households should have reduced consumption by more than younger households. Within a general increase in the price level, there will always be some prices rising more rapidly than others and, as a result, some groups will believe they are adversely affected by increases in that particular commodity. Available evidence does not indicate that the total price level rose more rapidly for any age group during this period (see Clark et al., 1984, Chapter 3). Rising energy prices may have differentially disadvantaged the elderly, however, while other relative price changes tended to offset this effect.

Energy consumption in the survey years was also influenced by changes in real income. During the 1970s, the real and relative income of the elderly rose. The real income of families 65 and over rose by 20 percent between 1970 and 1980. By contrast, the real income of families whose head was aged 45-54 rose by only 5.9 percent. As a result, the income of the older families rose from 41.7 percent of the younger households in 1970 to 47.3 percent in 1980 (Clark et al., 1984, Chapter 5). This rising real income in conjunction with larger income elasticities should have produced larger energy budget shares for the elderly compared to those for younger households.

In a period of falling real energy prices, the higher expenditure share for energy in the budgets of the elderly works to their advantage. Again, however, there is no direct evidence of age-specific substitution effects. Nevertheless, both income and substitution effects work to increase the welfare of the elderly through lower real energy prices.

Conclusions and Recommendations for Further Study

This preliminary study has revealed several interesting relationships concerning energy consumption of older households. These findings should be useful in considering public policy options and as a framework for further study. The primary findings are:

-- Older households spend significantly larger proportions of their budgets on energy.

-- The determinants of household energy expenditures differ significantly with age.

-- Total expenditures of income is a very important determinant of energy consumption.

-- The energy income elasticity is relatively low but rises with age.

-- Households in the Northeast and North Central regions allocate more of their budgets to energy consumption than families living in the South and West.

-- Families in large cities tend to have smaller energy budget shares.

Further investigation of the age-household energy consumption relationship is necessary prior to reaching any definitive conclusions. This additional research should incorporate the Continuing Consumer Expenditure Survey begun in 1980. Data from 1980-81 recently has been released and 1982-83 information should be available by the end of 1985. Using these data, a comparison could be made with the 1972-73 CES data and any changes in expenditure patterns could be observed. Similarly, additional years of data (1980-82) of the RECS could be examined. A complete and careful examination of these currently available data would permit further testing of the relationships presented in this paper and determination of whether the link between energy expenditures, age, and income have remained constant during this decade of highly volatile energy prices.

A more comprehensive study of household energy consumption would concentrate on the different sources of energy. Such a study could calculate budget shares for gasoline, electricity and fuel oil separately and could estimate the determinants of these budget shares. Examination of these expenditures in the different data sets should provide further evidence in how households respond to price shocks of one type of fuel. We expect that the findings of a study of these separate fuel shares would help explain observed regional differences in energy expenditures. The findings from such a study could also be used to project the impact of future changes in relative energy prices.

REFERENCES

Clark, Robert, George Maddox, Ronald Schrimper, and Daniel Sumner, Inflation and the Economic Well-being of the Elderly, Baltimore: Johns Hopkins University Press, 1984.

Schrimper, Ronald and Robert Clark, "Health Expenditures and Elderly Adults," Journal of Gerontology, Vol. 40 No. 2, pp. 235-43.

TRANSPORTATION NEEDS OF A "GREYING" AMERICA*

by: S. Fred Singer*
Candace C. Crandall*

Introduction

The American population is aging.

By the year 2010, when the baby boom generation matures, one in five Americans will be more than 60 years old, the numbers of individuals over 80 will have nearly tripled;[1] and fully one-third of the Federal budget will be earmarked for programs and services to the elderly;[2] While the advent of an older society challenges the nation's ability to adapt, it also offers opportunities to develop new technologies, to tap valuable resources of work and life experience, and to more fully integrate the elderly into American society as a whole.

The baby boom generation in particular has surprised and challenged the U.S. at every stage of the group's development. While the children of the 1950s and early 1960s had fairly predictable, if budget-straining, needs, other trends that developed as this generation moved into adulthood--the high divorce rate, low birth rate, and overwhelming influx of women into the workforce, for example--were more difficult to foresee. In 2010, it is likely that the problems and personal issues facing this older population will be vastly different from the those facing the elderly today. But with technological advances in medicine, housing, and transportation, some of them at least will be easier to remedy.

---

*George Mason University

[1]U.S. Bureau of the Census, Projections of the Population of the United States: 1982 to 2050 (Advance Report). Current Population Reports, Series p-25, No. 922, October 1982. Projections are middle series.

[2]Heinz, John. Chairman, U.S. Senate Special Committee on Aging. Aging America: Trends and Projections (U.S. Senate Special Committee on Aging).

What are the needs of older Americans? Specifically, what are their needs in regards to transportation, and how will those needs change over the next quarter century? What influence will energy prices and available fuels have on transportation patterns? What lifestyles will evolve, and how will the availability of adequate transportation affect local mobility and patterns of migration? More important, how will new modes of transportation help older individuals lead productive, satisfying, and independent lives?

The Elderly Today

In 2010, the lifestyles of older Americans--defined here as those 60 years old or older, unless specified otherwise*--will be determined to a great extent by the same factors that affect their lifestyles now: where they live, overall health, financial status, and the numbers of their age group within a given area. But a new public perception of the elderly as productive, viable individuals may signal a major social and cultural change: one that has benefits for Americans of all ages.

Retirement is a relatively recent phenomenon, and the concerns of many of today's older Americans are based on a unique social system and value structure that emphasizes youth, age segregation, and self-reliance.

Currently, those under 60 tend to associate old age with persons--typically women--coping with loneliness, reduced income, and increased poverty. The elderly, the young believe, are "survivors" who exist from year to year under the cloud of ill health, death, and institutionalization. This view is largely a myth. While older persons, particularly women, are more likely to be living independently, the rates of poverty for this group closely parallel rates of poverty for the younger population with the exception of elderly black females, who post considerably higher rates of poverty than their younger counterparts.[3] As the White House Conference on Aging concluded in 1983, "serious problems do exist" among segments of the older population, but "the great majority of elderly Americans...are the wealthiest, best fed, best housed, healthiest, most self-reliant older population in our history."

This reasoning is based on trends established over the last 35 years which revealed significant improvements in the lifestyles of the nation's elderly. Most notable were improvements in education, income, and health, factors which directly or indirectly affect a persons's ability to make use of available means of transportation.

---

*Although many services and discounts are offered to "seniors" aged 55 and older, most Americans retire between 60 and 65. For our purposes then, older persons are defined as those over 60.

[3]U.S. Bureau of the Census, Money Income and Poverty Status of Families and Persons in the United States: 1982. Current Population Reports, Series p-60, No. 140.

According to the 1985 Economic Report of the President, men approaching the end of their working careers can expect to spend about 15 years in retirement, often with a spouse who also makes a transition from worker to retiree. For women who tend to live longer than men and are less likely in their later years to remarry following the death or divorce of a spouse, the retirement years are especially important because they are more likely to face them alone.[4]

Although older people are spending more years in retirement, those choosing to live with adult children now constitute less than ten percent of the elderly population.[5] Instead, more and more older people are choosing to live in separate residences, usually with adult children living nearby. According to a 1980 Population Bulletin (vol. 35, No. 4) of the Population Reference Bureau, Inc., 73 percent of Americans over 65 owned their own homes, and 80 percent of that number had paid off the mortgage thereby reducing housing costs.

The financial and physical ability of the elderly to lead independent lives is a positive sign. Thirty-five years ago, the elderly were a disadvantaged group, but since 1950 the median real income (before taxes) of the elderly has more than doubled.[6] The income of the elderly has increased faster over the past two decades than that of the non elderly population. In 1958, one of every three older citizens had incomes below the poverty line. By 1970, that figure had been reduced to one in four, and by 1982, the elderly had slightly lower poverty rates (15 percent) than younger persons.[7] (The current government definition of poverty is based solely on money income and does not include the value of "in-kind public transfers" such as food stamps, publicly owned or subsidized housing, medicare, and medicaid. If the value of these programs is added to the cash income of the elderly--and admittedly this is a controversial view--the numbers of older Americans under the poverty line drops to 3.3 percent.[8])

---

[4]Economic Report of the President, Transmitted to the Congress in February 1985, p. 159.

[5]Ibid, p. 169.

[6]Ibid, p. 160.

[7]Aging America: Trends and Projections. (U.S. Senate Special Committee on Aging in conjunction with the American Association of Retired Persons), Section 2, p. 36.

[8]1985 Economic Report of the President, p. 167.

For those older Americans who still hover at or near the poverty line--based on cash income--studies have shown that financial status is directly related to their pre-retirement incomes.[9] Poverty is more likely to be found among disadvantaged minorities, women, and those over 85. Because of low earnings and--for women and minorities--fewer years in the workforce, members of these groups have been less able to accumulate assets and plan for retirement. As a consequence, poverty among the elderly stems not so much from the fact of aging but from the same factors that lead to poverty at all ages: lack of education and work history.

But across the board this picture has dramatically improved. In 1950, older Americans had an average of 8.2 years of formal education. By 1980, that figure had risen to 10.2 years;[10] and is expected to rise to 12.0 by 1990.[11] The emphasis today on college degrees and the tendency of young blacks to stay in school longer[12] means that the education statistics for the nation's elderly will continue to rise as these better educated persons reach retirement age.

From 1950 to 1980, the average number of years women spent in the workforce jumped from 15.1 to 27.5 years.[13] American women of all ages now account for roughly half of the workforce and half of the college enrollees, leading to greater opportunities for each to accumulate an adequate retirement base of pensions, Social Security, and financial assets. With more work experience, elderly women in 2010 will also have more opportunities for full or part-time employment, an important option.

---

[9] 1985 Economic Report of the President, p. 169.

[10] Aging America: Trends and Projections, Section 5, p. 87.

[11] Fowles, Donald. "The Changing Older Population," Aging, May-June 1983 (U.S. Department of Health and Human Services) p. 8.

[12] Ibid, p. 9.

[13] Work life estimates from Smith, Shirley; New Work Life Estimates, Bureau of Labor Statistics Bulletin 2157, November 1982.

In matters of health, Americans, including the elderly, are healthier today than they were ten or 20 years ago. While the rate of nursing home care for those over 60 has doubled since the introduction of medicare and medicaid in 1965, it is still quite low, only about five percent.[14]

In addition, in the 1981 National Health Interview Survey conducted by the National Center for Health Statistics, 80 percent of the elderly rated their own health as good or excellent when asked to compare their health with others of their own age. Despite reports by an equal number of one or more chronic conditions, such as arthritis, heart problems, hypertension, and diabetes, the elderly generally appear to have adapted to the infirmities of age and do not see themselves as grossly impaired.

For the eight percent of those over 60, and the 31 percent of those over 85, who are more seriously limited in their mobility, help is available from many quarters. Over 80 percent of the home care for non-institutionalized older persons is provided by family members and, secondarily, friends.[15] Less visible is an informal network of neighbors, volunteer groups, and church organizations which provide the bulk of nonroutine assistance, including home maintenance and transportation.[16]

Among today's elderly, those who have chosen to retire have generally done so not for health reasons but because economic incentives have prompted the decision to consume more leisure at the expense of income. The elderly have lower average tax rates; appproximately two-thirds of those over 65 pay no income tax at all.[17] Further, features of the Social

---

[14]1976 Survey of Institutionalized Persons prepared by the Center for Population Research, Georgetown University, for the Administration on Aging, Grant No. 90-17-1681.

[15]Barberis, Mary. America's Elderly: Policy Implication, (Population Reference Bureau, Inc., policy supplement to Population Bulletin, vol. 35, No. 4) January 1981, p. 11.

[16]Comptroller General of the United States, Report to the Congress: The Well-Being of Older People in Cleveland, Ohio (Washington, D.C.: U.S. Government Printing Office, 1977).

[17]1985 Economic Report of the President, p. 164.

Security system discourage work past the age of 65 and encourage the elderly who do work to seek part-time rather than full-time employment. These disincentives to work were built into the system because it was initially believed that older workers should be encouraged to leave the labor force to make room for new workers. During recent bouts of high inflation, however, press reports and some surveys suggested an increase in the number of older people who were postponing retirement or returning to work to supplement fixed incomes.[18]

In the future, for those who do choose to continue working either full or part time, proposed changes in the Social Security system may eliminate regulations which penalize employment. Indeed, with today's low birth rate, and an estimated support ratio of only two "working age" persons to each person of "retirement age" by 2010,[19] encouraging delayed retirement may be in the best interests of both the nation and the older population. Although Social Security benefits were never intended to provide full financial coverage for older Americans, three of ten retired persons currently depend on Social Security for 90 percent of their income.[20] A smaller ratio of working age to retirement age will likely result in a substantial increase in taxes and/or severe cutbacks in benefits. As a result, employment past age 60 may become imperative, both to reduce the dependency of the elderly on federal programs and to broaden the tax base. There are social benefits as well. The elderly who are currently employed consistently report better health and greater satisfaction with their personal lives than older persons who are not employed. This is due, in part, to higher incomes, enhanced self-esteem, and greater opportunities for social contacts.

---

[18]Stevens, C.W., "Aging Americans: Many Delay Retiring or Resume Jobs to Beat Inflation and the Blues," Wall Street Journal, November 5, 1978; Robert Lindsey, "Older People, Hard Hit by Inflation, are Delaying Retirement," The New York Times, August 17, 1980, p. 32; and "Why Many Keep on Job as Long as Possible," Special Report, U.S. News & World Report, September 1, 1980, p.

[19]America's Elderly: Policy Implications, p. 9.

[20]Ibid, p. 22.

At the beginning of this century, only six percent of the total U.S. population was 60 years old or older. Now, with persons in this age group accounting for 17 percent of the population,[21] the elderly are increasingly being seen and heard. Because the elderly are financially better off, business and industry have begun to recognize older Americans as a significant segment of American consumers. Grandmothers are replacing teenagers in fast-food commercials and whole industries are springing up geared to the perceived special needs of the nation's elderly.

Further, the attitudes of older adults reflect these improvements in lifestyle. In a recent national survey, more than half of those over 60 said they were "highly optimistic" about their futures, while close to 30 percent were categorized as "enjoyers who manage to master all the difficulties that come with old age."[22]

---

[21]Fowles, Donald. "The Changing Older Population," p. 6

[22]Americana Healthcare Corporation. A Report on Aging in America: Trials and Triumps (Monticello, Ill., 1980) pp. 21-33.

Transportation Needs: Scenarios for 2010

For the baby boom generation a quarter century from now, some aspects of their lives can only be guessed at. By and large, they will be healthy, well-educated, and productive--and they may still have a few surprises up their sleeves as far as setting national trends. Where these people choose to live, and their modes and frequency of travel, may well depend on behavior patterns established during their younger years.

Behavior patterns set by today's elderly are not necessarily predictive of those for the baby boom generation. When today's elderly were growing up, life moved at a slower pace and was more oriented toward the extended family. Too, long-distance travel was still difficult and time consuming, people developed emotional attachments to their neighbors and neighborhoods, and the emphasis was on creating stability by maintaining an environment that was familiar and predictable. Perhaps as a result of this, today's elderly have tended to stay put from middle age on, and are more heavily concentrated in the cities and rural areas of the Northeast and North Central regions.

Between 1975 and 1979, only 18 percent of those over age 65 changed residence, according to a report by the U.S. Bureau of the Census. By way of contrast, 40 percent of the total population changed residence during the same period.[23] Since members of the baby boom generation have changed residence more frequently, they have had fewer oportunities to develop emotional attachments to their neighbors and neighborhoods. Many have developed patterns of changing residence to improve their circumstances--for example, moving to a newer or more convenient home, or to a better job in another city. The effect this will have on where they choose to live on reaching retirement age remains to be seen.

---

[23]U.S. Bureau of the Census, Current Population Reports, Series P-20, No. 353. "Geographic Mobility: March 1975 to March 1979," p. 15. Excludes moves from abroad.

In 2010, transportation needs for most older Americans --those with good physical mobility and particularly those who remain employed--will be virtually unchanged from that of the younger population. One consequence will be a significant increase in the total number of drivers and in vehicle miles traveled, requiring an even greater expansion of the nation's highway system. According to figures compiled by the U.S. Department of Energy (DOE) in 1977, 64.5 percent of the people between age 60 and 69 held a driver's license, as did 47.2 percent of those over 70. Had the driver ratio for persons over 60 matched the national average for the entire driving age population that year, 80.8 percent, the total number of drivers would have increased by 5.2 percent. According to that same DOE study, 92.1 percent of persons aged 30 to 34 held driver's licenses in 1977. With members of this age group helping to swell the ranks of the elderly to 55 million (of a U.S. Bureau of the Census projected total of 283,238,000) by 2010, the percentage increase in total drivers will likely be even greater than that projected in 1977.

For older persons with less physical mobility, place of residence will have a direct impact on transportation requirements, State and Federal budgets, the development of new technologies, the rise of social institutions, and the quality of their lives.

There are several possible scenarios:

1. If the elderly choose to follow the lead of their parents and grandparents, age in place so to speak, then the suburbs will develop high concentrations of older citizens.* Freeways and public transportation systems built for younger commuters will serve older ones equally well, but in this scenario will result in the greatest increase in vehicle miles traveled. For those with physical impairments, business trends promoting greater customer convenience may sharply reduce their need for transportation: for example, the construction of many small shopping centers in the suburbs instead of a few large ones, a convenience store on wheels that would retail frequently needed items on a regular route,

---

*The term: "grey ghetto" is sometimes used to denote areas with large elderly populations. With its connotations of poverty, this term is inappropriate given the aforementioned improvements in lifestyle.

or shopping by computer. When transportation is required for shopping or medical appointments, one solution already being offered by church and volunteer groups in some communities is a small bus or van service that transports the elderly to and from their home. Too, some grocery chains are reportedly starting bus services to their supermarkets for the convenience of older customers.

A better solution, and one that would promote greater self-reliance for those restricted by walkers and wheelchairs, would be the development of a small electric car for short distance travel. These kinds of vehicles would be especially useful in neighborhoods with high concentrations of elderly people and would be more practical in inclement weather than the bicycles and adult tricycles that some now use.

Today's elderly, even when maintaining their own residence often depend on adult children, particularly adult daughters, to provide transportation. With women now making up a large part of the workforce, there is concern that more and more of the elderly will find themselves without transportation and without the services of a primary caregiver. This view, however, does not consider the adaptability of American families. Working adults, already accustomed to taking time off from work to take children to doctor and dental appointments, and to scheduling shopping trips during evening and weekend hours, will likely make these same accommodations for their elderly parents. For older persons who do live with adult children, an increasingly popular solution is the so-called adult day care center, which provides recreational activities, shopping excursions, and other activities for elderly persons while their adult children are at work. Paid "homemaker services" are an option for older persons who live some distance from their children, yet require some assistance.

2. An alternative scenario to the "greying" of the suburbs is that the elderly will give up their high-maintenance suburban tract homes and move to planned retirement communities, either near their original homes or in Sunbelt states where the warm climate allows a greater variety of recreational activities.

According to recent studies, those older Americans who have already migrated from the Northeast and North Central regions to other parts of the country have favored southern California, Arizona, and Florida. Florida in particular has the highest concentration of persons over 65, 17.3 percent.[24]

Those migrating to the Sunbelt are generally the younger-aged 64 to 74-and more affluent of the elderly population. Those who move later in life are more likely to relocate for health reasons, perhaps to live closer to adult children.[25]

Whether the Sunbelt migrants tend to stay, or return in later years to their original place of residence, is not known. If they do stay, and if the migration of older people to Sunbelt areas is a trend that carries over into the next century, there will be a considerable demand for services to the elderly, including special transportation, in the states where they settle.

Again, high concentrations of older persons, either in a few Sunbelt states or in planned retirement communities across the nation, foster the development of new retail services and new modes of transportation. A drawback to these first two age-segregated scenarios, however, is that they also tend to isolate the elderly from the rest of society.

3. A third scenario holds greater possibilities for the integration of older people into society and would put less strain on Sunbelt state budgets. With higher incomes, more leisure, and more opportunities for full-or part-time employment, the elderly may move from single family homes in the suburbs to smaller, more efficient apartments or condominiums in the same city. Multi-generational high-rise apartments and condominiums have already proved popular in some areas

---

[24]Aging America: Trends and Projections, Section 1, p. 15.

[25]Soldo, Beth J. America's Elderly in the 1980's (Population Reference Bureau, Inc. vol. 35, No. 4, November 1980) p. 13.

and, as an added benefit, often provide space for convenience stores, barber shops, drycleaning establishments, doctors' offices, and other services in the same building. Some buildings also provide shuttle buses to shopping centers and supermarkets. These services reduce transportation needs and appeal to the retired and the employed, the young and the old. Further, the mixing of generations--college students, young families, older professionals, and the elderly--may serve to eliminate many of the misconceptions people of one generation have of another. But a mix of generations, as well as the necessity of traveling on city streets and highways, makes short distance, slow-moving vehicles impractical. For independent travel, the elderly in this scenario would depend much more heavily on conventional automobiles, taxis, and public mass transportation, though vehicle miles traveled would be less than in the commuting from the suburbs scenario.

Transportation Modes

Which modes or means of transportation would one choose to fill a particular need for transportation? How does this choice depend on age and its associated attributes?

The main economic characteristics of each trip are time and cost. Each trip involves time during which one usually cannot carry on customary activities. For example, the average worker is not paid for his commuting time and usually must give up some leisure time that has value to him. The time taken to reach the beach, the mountains, or other resort areas cuts into one's vacation. Some people enjoy the traveling experience; they catch up on sleep or on reading, or they socialize. However, there is usually a cost involved that relates to the value of leisure time.

Economists who have studied this matter find that travel time costs about one-third of the wage rate.[26] That is, a person making $10 per hour will value his leisure time at about $3.30 per hour. This empirical result is obtained by observing how much more people are willing to pay in transport price in order to reduce travel time. Retired persons, presumably having an abundance of leisure time, would be more likely to opt for longer duration trips that cost less. The retired would tend to choose a five-hour bus trip over a one-hour plane flight.* Indeed, many retired elderly travel in trailers around the country, take cruises, and purchase travel packages that involve leisurely modes of transportation.

Each trip also involves a monetary cost, either the price of a ticket or of a cab, or the cost of gasoline for one's car. As for any other economic service that involves a price, there is both a demand elasticity and an income elasticity. That is, the demand for the service decreases as the price goes up; the demand increases as income rises. In the case of transport service, however, the total cost is the monetary cost, plus the time factor which--as we have just discussed--is less for the retired elderly.

---

[26]Beesley, M.E., "The Value of Time Spent in Travelling: Some New Evidence." Economics, May 1965, p. 1974.

*Trains have become both costly and less available, and therefore cannot be included in this comparision.

In addition to travel time, there are other factors especially relevant to elderly persons who are physically handicapped. With reduced physical vigor, the elderly would avoid a long walk to a public bus stop. They would also tend to avoid air travel involving complicated transfers when going a medium distance. But most important in choosing a transport mode are the ability to drive and the ability to walk. Not being able to drive a car, e.g. because of poor vision, forecloses the flexibility of a private automobile, unless driven by a relative or hired driver. Not being able to walk forecloses many other options, depending on the degree of physical limitation.

With this introduction, we can now examine transport modes in relation to established transport needs by means of a matrix.

Transport needs:

A. Commuting: Frequent; regularly scheduled; point-to-point; transport need usually requiring from ten to 120 minutes per day; intra-urban.

B. Necessities: Less frequent; flexibly scheduled; home-to-different point (doctor, supermarket, restaurant, etc.) trip, usually requiring from ten to 30 minutes; intra-urban.

C. Discretionary: Business or vacation trips; flexibly scheduled; irregular; requiring from hours to days of travel time; generally inter-urban.

Transpo tees:

1. Single household passengers departing from single residence.

2. Multiple household passengers, pre-arranged (e.g. car pool), departing from several residences.

3. Passenger groups, not arranged, departing from a terminal or stop.

TRANSPORT MODE MATRIX

	1. Singles	2. Multiples	3. Groups
A. Commuting	private car; taxi	carpool; van	mass transit; private bus
B. Necessities	private car; taxi		mass transit; private bus
C. Discretionary	private car; taxi	chartered bus; chartered plane	intercity bus; airplane

A glance at the matrix shows the importance of the private automobile as a flexible transportation mode. If an elderly person cannot drive, a friend, relative, or hired driver can take over. So far as fuel requirements are concerned, the exact nature of the driver is immaterial. A taxicab fits much the same category, but is likely to be more fuel-conserving (assuming that an elderly person would own a car for a longer period rather than invest in a presumably fuel-conserving new car).

A bus is a common mode of transport for the elderly who are not physically impaired. An important public policy issue is whether buses should be modified to accept handicapped persons, specifically those in wheelchairs. This issue is confused by the fact that public transportation services, whether bus or train, are often subsidized. If public transportation were not subsidized, private taxis might be competitive--especially during off-peak hours--and more convenient. It may be both cheaper and better to subsidize a taxi service for the handicapped than to modify existing buses.

A particularly appealing technological solution might be to develop a low-speed, economical "town car," perhaps electrically-driven like a golf cart, for local use (shopping, visiting nearby friends, etc.). In a retirement community, such vehicles would be used by those no longer able to handle bicycles or adult tricycles. If the elderly wish to drive outside of the community on high speed highways, they could use or rent a full-sized car.

An important feature, not directly revealed by the matrix, is off-peak travel, which by leveling also reduces the intensity of daily transportation peaks during commuting hours.

A. For commuters, flexi-time arrangements, as well as computer and electronic communications leading to "electronic offices" in the home, reduce the need for worker's physical presence during fixed hours.

B. For shopping and other necessities, the use of vans and public buses during off peak hours for shuttle services to shopping centers. In addition to reducing traffic, such a service (perhaps run by the shopping center) reduces the need for parking spaces.

C. Discretionary travel can, of course, be off-peak by choice, or promoted, for example, by the use of off-peak fares and off-peak tolls.

Fuel Requirements

For this paper, we will consider two extreme transportation scenarios: 1. an all-oil scenario, and 2. a no-oil scenario. In 2010, the most likely scenario would combine technological features of both, leading to reduced oil consumption for transportation.

An all-oil scenario considers gasoline-using cars, diesel-using buses and trains, and electrically-driven intra-urban trains (subways). This extension of present technology involves no fundamental changes except for improvements in efficiency. Such improvements would come about as oil prices rise slowly, after reaching a minimum of about $20 a barrel around 1986. Keep in mind, however, that fuel cost is usually a small portion of the total operating costs of a car, which include depreciation, insurance, and repairs.* For example, 10,000 miles per year at 25 miles to the gallon, and at a price of $1.20 per gallon, comes to only $480 per year.

A no-oil scenario can also be constructed, based on the town car concept. The town car can be electrically powered, with the ultimate fuel source being coal, nuclear power, or hydropower. For the elderly who are physically impaired, another possible technology is a wheelchair that converts into, or can be rolled into, a town car. This obvious extension of today's electrically-driven wheelchair awaits only the development of a cheaper, lightweight electric storage battery that can be repeatedly discharged and recharged without breaking down.

A full-sized automobile, particularly a rental, can be methane-powered, using compressed natural gas (CNG). Such an automobile would involve no technical problems, only logistic ones, which could be handled fairly easily in a fleet operation that charges high-pressure bottles with CNG. With the development of a cheap lightweight pressure bottle, the commercial use of CNG could become widespread.

---

*Fuel cost does not include the full cost of building and maintaining roads, tunnels, bridges, and traffic safety equipment. This cost is usually borne by state taxes and bond issues rather than by the drivers who use the roads. A more rational and fairer method would be to impose user fees, whether as road tolls or higher motor fuel taxes. A 60¢ per gallon fuel tax, for example, would add $240 per year to the fuel cost of driving. An incidental result would be enhanced oil conservation, a demand for more fuel-efficient cars, and reduced oil imports.

Methanol, produced from natural gas (methane), is another possible fuel that can replace gasoline in autombiles. Being a liquid it can be handled more easily than CNG.

Not all of these technological changes are directly related to issues of the elderly, but the increasing proportion of older persons and the effects of their lifestyles could create a strong demand for such innovations. Since our society's economic development is driven by consumer demand, 55 million elderly may well exert an influence on the development of new products.

One final word about the probable world energy situation in the years 2010 to 2025. Electric power use will be greatly increased, including here in the United States where its usage is already high. Nuclear, hydro, and coal will be the major sources of electric power, with oil, natural gas, and renewables--such as photo-electric--producing lesser amounts. Electric, gas, and solar energy will dominate domestic applications, including space heating and water heating. Transportation will use oil, electricity, and CNG or methanol, with continued reliance on the internal combustion engine.

Oil products will be primarily derived from crude oil (petroleum), with its main source in the Saudi Arabian peninsula. Synthetic oil will be of minor importance since the price of oil will not much exceed the price of competing gas or electric power. We would estimate that the price would not exceed $50 a barrel (in 1985 dollars), and indeed could be as low as $30.[27] This lower price is still high enough to encourage some replacement of oil as the primary fuel for transportation.

---

27 Singer, S.F., Free Market Energy: The Way to Benefit Consumers, (Universe Books, New York, 1984).

Conclusion

Our assessment of the future, both in terms of energy and the status of the aging, is generally optimistic. Energy prices will be moderate, not much greater than today's in real terms (1985 dollars), with higher-priced oil increasingly replaced by competitive fuels, even in transportation applications. Technological advances will likely include electric cars as well as conventional automobiles fueled by compressed natural gas and methanol.

The aging, especially women, will be better off in 2010 than they are today: better health, higher incomes, more self-reliance. The major factors that will influence the transportation needs and transportation modes of older Americans are, as now, retirement age and physical handicaps.

Retirement generally precedes the age when physical limitations restrict travel outside of the home. This period between retirement and the onset of physical disability is lengthening and in many cases extends to a quarter of a century or more, i.e. 25 years of leisure, often with extensive recreational travel.

A major uncertainty then revolves around retirement age. If the trend of the past few decades toward early retirement reverses, than the definition of the "aging" will change, and so will the demography of older Americans. A reversal may be brought about by economic factors, relating to the increased dependency ratio (the number of nonworking individuals divided by the number of working individuals who pay Social Security taxes). Technological factors, such as "electronic offices" in the home may also assist in such a reversal. By eliminating the need to commute to work, such offices would negate many of the employment restrictions that come with physical handicaps and advanced age.

Another major uncertainty affecting transportation needs involves the place and mode of residence of the retired elderly. But, as indicated by our transportation matrix, the private automobile retains a predominant role as the preferred transportation mode. Even for handicapped older persons, cars (or taxis) driven by others may provide primary transportation.

To sum up: Despite an increase in vehicle miles driven, with fuel costs moderate, greater mileage efficiency, and increased personal incomes, it is likely that America's elderly in 2010 will spend a smaller fraction of their incomes on transporation than they do today.

U.S. DEPARTMENT OF
HEALTH AND HUMAN SERVICES
Washington, D.C. 20201

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE, $300

Postage and Fees Paid
U.S. DEPARTMENT OF H.H.S.
HHS-393

U.S. MAIL

Special Fourth-class Rate